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EDUCATIONAL DIAGNOSIS
AND THE
MEASUREMENT OF SCHOOL ACHIEVEMENT

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EDUCATIONAL DIAGNOSIS

AND THE

MEASUREMENT OF SCHOOL ACHIEVEMENT

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BY

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PREFACE

In measuring school achievement much progress has been made in the last few years. More refined as well as more adequate instruments for measuring achievement have been devised. A wider range of material has been included within the measurable products of education. Much progress has also been made in devising instruments for measuring the general mental ability of pupils to do school work. As valid comparisons of achievement can be made only when this element is also taken into account, the mental tests have contributed no small part to a successful survey of school achievement.

When the mental tests were first used in the surveys of achievement they were used independently of the achievement tests and merely for interpretative purposes. In the earlier surveys only a limited number of the various phases of school work were measured and these measurements were usually made by outsiders employed for the purpose. In general the recommendations for remedial changes were made only to the administrative staff. Wherever these were carried out, re-surveys were seldom conducted to determine the effects of the recommendations. The results were seldom available until too long after the survey had been completed to be of much immediate interest in modifying classroom instruction. Besides, the results were practically never available in such a form that they could be of use in diagnosing the conditions of individual pupils or even in diagnosing individual class room situations. Yet these two features would seem to be the two most important outcomes of such a survey.

In connection with achievement surveys carried out in the cities of St. Paul, St. Cloud, Stillwater, and Wayzata, Minnesota, by the author, a technique has been developed whereby an achievement survey can be made quite as well by the local school people themselves as by outsiders, and wherein the results may be made immediately available and intelligible for evaluating class room practices, deciding upon promotions, assigning school marks, or making a more adequate classification of the pupils for instructional purposes. This has necessitated the devising of educational scales in several subjects of instruction in which they were lacking, co-ordinating the results on achievement scales with mental test scores, working out a manual of directions by the use of which most technical difficulties involved in the scoring of tests will be eliminated, the devising of an easily used and easily interpretable series of individual and class record cards and a distribution sheet for summarizing the scores, and inventing the necessary charts for finding whatever derived measures may be desired.

The method and materials have been used successfully in a small town of a few hundred, small cities of a few thousand population, and in a large city of nearly 300,000. The teachers, principals, and superintendents have showed equal appreciation of the results. In the present volume results are presented from these various surveys to illustrate the uses that may be made of them as well as the conditions that may well be expected to be found. Finally a program for making an achievement survey is suggested and described in detail. Such an achievement survey, with all the wealth of information it conveys to the teachers, may be carried out in the time usually given over to final examinations. In comparison with the results of the usual final examination procedure the findings of an achievement survey are of almost inestimable value.

To Mr. L. L. Everly, Director of the Bureau of Research of St. Paul, to Mr. P. R. Spencer, formerly superintendent of schools at St. Cloud, Minnesota, to Mr. R. N. Young, formerly superintendent of schools at Stillwater, Minnesota, and to Mr. Erick Selke, superintendent of schools at Wayzata, Minnesota, the author desires to express his appreciation for opportunities for making the surveys as well as for assistance and helpful criticisms and suggestions.

M. J. Van Wagenen.

Berkeley, Calif.
August, 1926.

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EDUCATIONAL DIAGNOSIS

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CHAPTER I

DISCOVERING WHAT ONE'S SCHOOL IS ACHIEVING

So many are the minor details involved in the management of a school that the important function—the achievement of the pupils—is frequently taken for granted. Nor could it very well have been otherwise until adequate means of measuring school achievement became available. Classrooms have long been visited and inspected, to be sure. Nor have many of the teacher's activities escaped evaluation and criticism. But for the most part these evaluations have been made on the basis of intangible, subjective standards. Until the development of the measurement movement the children's skills, ranges of information, and abilities to deal with problems received but scant attention as compared with the performance of the teacher. Happily the attention of the critic and teacher alike is becoming more and more centered upon the activities and achievements of children. And for this shift of attention the measurement movement is in no small way responsible.

With the Measuring Instruments Now Available Very Significant Educational Facts May Be Discovered. Among these facts are the actual achievements of the children. With the educational scales that have been devised the pupils' skills in handwriting, drawing and sewing may be measured just as we measure their height or their weight. How well they can read or how rapidly, and how well they can write English composition need no longer be measured subjectively as we measure the quality of a picture. How difficult words can be spelled or how difficult tasks and problems in arithmetic can be done by a child with a definite degree of correctness can be determined quite as accurately as we commonly measure length. Ranges of information in American history, geography, general science and physics are likewise subject to quantitative measurement. Nor are the abilities of children to do problems involving facts in arithmetic, history and geography beyond the realm of quantitative measurement. Furthermore these measurements of educational achievement are of the same nature as our measurements of height and weight. They are made in terms of a common unit of measurement like the inch or pound; the amounts are tangible and visible and independent of the instrument used to measure the trait.

With the mental tests that have been so rapidly developed during the past few years the capacities of the children to achieve and their normal rates of gain in mental age and achievement are also quantitatively measurable. No longer need we speak of a child as being bright or dull. With but a few hours of testing his mental age may be determined with a high degree of accuracy. From this his intelligence quotient or rate of gain in mental age may be quickly ascertained. Whether we think of a child's mental age as a stage in mental development or as a level of common achievement attained without effort through exposure to a common environment, it is highly significant in indicating what should be expected of him in the way of school achievement.

Even a pupil's quality of work is now more accurately and definitely measurable than was his spelling ability but a few years ago. Through the giving of both mental tests and a wide range of educational scales to some 1200 children approximately equally distributed as to sex and among the upper half grades of the elementary school, mental-age norms of achievement have been determined for practically all the subjects taught in the fifth, sixth, seventh and eighth grades. Variations from these norms may be expressed in terms of scale scores, just as we speak of a child as being nine pounds underweight for his height, or in terms of an achievement quotient, which indicates the per cent that a pupil has achieved of what children of his mental age have, on the average, achieved under the usual conditions of instruction.

What a City School Principal Discovered about Her School. The principal of school A was as well acquainted with the work of her teachers and pupils as any principal could hope to be through frequent visiting of the classrooms. Yet she did not feel entirely satisfied that she knew what the pupils were achieving. She desired to know what her pupils were accomplishing in comparison with their capacities to achieve as well as in comparison with the achievements of pupils in other schools. Such information could be obtained neither from the teachers' marks nor from the scores made on the usual examinations given at the close of a term. An achievement survey promised to be the simplest and most adequate means of obtaining the desired information. This, of course, would take time, yet if substituted for the usual final examinations it would require little if any more of either the pupils' or teachers' time than the usual tests. Moreover, the teachers would be relieved of making out the examination questions. Owing to the conciseness of the questions and the definiteness of the acceptable answers, the task of scoring the papers would be less irksome than usual and the teachers' feelings of uncertainty in assigning the scores largely relieved. To any questions that might arise in scoring, the answer could be readily found in a copy of the "Teachers Manual for Using the Accomplishment Educational Scales".[1] In addition to these desirable features there are available mental-age standards as well as grade standards for each phase of school work to be measured. With these advantages in view the principal had no hesitation in undertaking a thorough-going achievement survey. From the available scales as listed in the "Teachers Manual for Using the Accomplishment Educational Scales" or in "Educational Scales and the Classroom Teacher"[2] a series for use in grades six, seven and eight could be quickly selected.[3] This series included a mental test as well as an educational scale in each phase of the work she desired to have measured. A short conference with the upper grade teachers, at which each teacher was supplied with a set of directions for giving the scales similar to the directions given on pages 226 to 231, together with the date and hour at which each of the scales should be given, insured a successful procedure in giving the achievement scales. To insure complete uniformity in giving the mental tests, these were given to all the classes by the same person. At convenient hours the teachers met together for scoring the tests, entering the scores on individual and class record cards and making out a summary of the results for the three upper grade classes of the school. This summary as made out on a distribution sheet is given in Plate 1.

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[1] Van Wagenen, M. J., A Teachers' Manual in the Use of Accomplishment Educational Scales (The Public School Publishing Company, 1925).

[2] Van Wagenen, M. J., Educational Scales and the Classroom Teacher (In preparation).

[3] The series consisted of the following tests:

The Terman Group Test of Mental Ability, Form A.

The Van Wagenen Spelling Scale A, Division 2 for grade 6 and Division 3 for grades 7 and 8.

The principal desired to know how the pupils in the sixth, seventh and eighth grades compared with one another in mental age as well as with the normal mental ages of 12 years 6 months, 13 years 6 months, and 14 years 6 months for the three grades at the end of the year's work. Since in the frequency column with $\overset{\text{``6''}}{\text{High}}$ at the top are given the number of pupils of each mental age in the sixth grade, it was simple for her to see that in mental age these sixth-grade pupils ranged from 11 years 1 month to 14 years 7 months—a variation of three and a half years. The four mentally youngest pupils were fifth grade rather than sixth grade pupils while the four mentally oldest pupils were in reality eighth grade pupils. Thirty of the thirty-eight pupils had mental ages between the beginning sixth-grade norm, as indicated by $\overset{\text{``5''}}{\text{High}}$ at the left edge or the short heavy horizontal line in the frequency column with the $\overset{\text{``5''}}{\text{High}}$ at the top, and the end-of-the-seventh-grade norm, as indicated by the $\overset{\text{``7''}}{\text{High}}$ at the left edge or by the short heavy horizontal line in the frequency column with the $\overset{\text{``7''}}{\text{High}}$ at

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The Thorndike-McCall Reading Scale, Form 2.
The Van Wagenen American History Information Scale R, Division 1 for grade 6 and Division 2 for grades 7 and 8.
The Van Wagenen American History Thought Scale R, Division 2.
The Posey-Van Wagenen Geography Information Scale R, Division 1 for grade 6 and Division 2 for grades 7 and 8.
The Posey-Van Wagenen Geography Thought Scale S, Division 1 for grade 6 and Thought Scale R, Division 2 for grades 7 and 8.
The Woody Arithmetic Scale (Van Wagenen Revision) R, Division 2 for grade 6 and Division 3 for grades 7 and 8.
The Buckingham Scale for Arithmetic Problems, Form 1, Division 2 for grade 6 and Division 3 for grades 7 and 8.

the top. The mid pupil of the class in mental age was 12 years 6 months old. Her mental age is indicated by the black square in front of the 3 in the sixth-grade frequency column. This, it will be noticed, coincides with the normal mental age of 12 years 6 months for sixth-grade pupils, as indicated by the $\overset{\text{``6''}}{\text{High}}$ at the left edge and the short heavy horizontal line just above the 3 in the sixth-grade frequency column. To the principal and teachers it was now clear that the sixth-grade class was a normal one in mental age but somewhat spread out. The mentally youngest pupils were found to be the oldest ones in chronological age, while the mentally oldest pupils were chronologically the youngest.

A glance at the first frequency column for the seventh grade on Plate 1 reveals a similar range in mental ages for the seventh grade as was found for the sixth grade. Three pupils were below the normal age of sixth-grade pupils and eight were above the normal mental age of eighth-grade pupils. One even had a mental age of 16 years, but he was found to be the youngest pupil in the class in chronological age. The black circle just at the left of the short heavy horizontal line in the frequency column with $\overset{\text{``7''}}{\text{High}}$ at the top shows that just half of the pupils were below 13 years 7 months in mental age while the other half were above 13 years 6 months. Like the sixth-grade class, the seventh-grade class was also a normal one in class mental age.

A somewhat different picture is presented by the eighth-grade frequency column. In mental ages the pupils ranged from 11 years 5 months to 16 years 11 months—a difference equivalent to five and a half grades. The mentally youngest pupil was in the eighth grade not because of superior achievement—her record was but little better than that of a normal sixth grade pupil—but because she was 19 years old. The class mental age of 15 years 1 month—indicated by the black triangle three two-month spaces above the short heavy horizontal line in the $\overset{\text{``8''}}{\text{High}}$ frequency column—was fully half a year above the normal mental age for eighth grade pupils at the end of the school year. Some of the older but less gifted pupils had evidently dropped out of school at the end of the seventh grade or during the eighth grade. In the eighth-grade class the gifted pupils were even more retarded than in the lower grades. Of the four pupils with mental ages of 16 years 11 months only one was a normal eighth-grade pupil in chronological age. The other three were chronologically only sixth-grade pupils. Yet in achievement all four pupils stood far above the eighth-grade norms and undoubtedly surpassed them when they were first promoted to the eighth grade.

Quite as impressive as the ranges of mental ages in these three classes are the extensive overlappings from grade to grade. From these mental-age frequency columns on Plate 1 it is obvious that the top half of any grade could have been interchanged with the bottom half of the next higher grade without increasing the range of mental ages of the class. In fact, had such an interchange been made, each class would have become a more homogeneous one in this respect. Significant as such facts may be, the principal was even more interested in discovering to what extent each class was approximating the standard achievement for the grade and also the norms for the class mental age in the case of the eighth grade.

On the distribution sheet in Plate 1 the data for the achievement tests have been arranged to give a visual answer to these questions and also to show the interrelations of the scores made in the different educational scales. The scores in each column have been spaced to indicate the mental-age and grade norms. Following through the row of scores for the sixth grade at the end of the year—the row with "6" High at the left edge—for example, it is evident that one should expect of a sixth-grade class a mid score of 52 in the spelling scale, of 50 in the reading scale, of 74 in the American history, the geography and the fundamental operations of arithmetic scales, and of 66 in the scale for arithmetic problems. When the class mental age is the same as the normal mental age for the grade, as in the case of both the sixth and seventh grades in school A, the grade and class mental-age norms will be identical. In the case of the sixth grade the mid scores—indicated by the black squares—were slightly above the norms in spelling and in the fundamental operations of arithmetic, half a grade or more below the norms in reading, in the thought phase of American history and in arithmetic problems, and more than a grade below the norms in the information phase of American history and in both the information and thought phases of geography. As a difference of six spaces in a column is equivalent to the normal gain made during a school year, it is apparent that in the information phase of American history the sixth grade was more than three years below both the grade and class mental-age norms. It is also significant that while the range of scores in spelling was no greater than the range of mental ages and the ranges of scores in reading and the thought phase of geography were but little wider, in all the other phases of school work measured the ranges of scores were at least one and a half times as great as the range in mental ages.

In achievement the seventh grade presents a picture strikingly different from that of the sixth grade. In arithmetic problems alone was the range of scores more than slightly greater than the range of mental ages. The location of the black circles in the frequency columns under spelling, reading and the thought phase of American history nearly on a line with the black circle in the seventh-grade mental-age frequency column indicates that in these phases of instruction the class was making normal progress. In arithmetic the class scores were somewhat above the grade and mental-age norms. In the information phase of American history as well as in both the information and thought phases of geography the class scores, as indicated by the black circles, were more than a year below the norms—more than two years in the case of the information phase of American history. In reading, in both the information and thought phase of American history, in the information phase of geography and in both the fundamental operations of arithmetic and arithmetic problems the seventh-grade class scores were farther above the sixth-grade class scores than the seventh-grade class mental age was above the sixth-grade class mental age. Whether this condition was due to superior teaching in the seventh grade or to a sixth-grade achievement record better than that of the present sixth grade a single survey cannot reveal. That the seventh grade had a better record than the sixth grade was undoubtedly gratifying to the principal.

In contrast with the sixth-grade class in school A an even narrower range in scores than in mental ages characterized the eighth-grade class. This may be accepted as an indication of a good classification or of superior teaching where the narrowness in range of scores has not been secured through failure to keep the gifted students approximating their capacity to achieve. The wider range of scores than of mental ages above the class scores does not suggest that this condition happened at all seriously except in the information phase of American history. Although the class mental age is half a year in advance of the normal mental age for the grade the class is closely approximating or surpassing the mental-age norms in both reading and arithmetic. In spelling the black triangle coincides with the short heavy horizontal line indicating the grade norm, while in the thought phase of American history it is somewhat below the grade norm index. In the information phase of American history and in geography the class scores are more than two grades below the mental-age norms of 90 and approximately two years below the eighth-grade norms of 86. Lack of emphasis upon the information phase of American history in the early grades unquestionably accounts for the poor achievement record made by the eighth-grade class. In the case of geography, the slight gain over the seventh-grade class scores is due to the relatively higher class mental age of the eighth-grade pupils. As it was not taught in the eighth grade one should not expect any higher scores than were made by the eighth-grade pupils in this case. In view of the fact that the seventh-grade class made only sixth-grade class scores, the principal was confronted with the problem of including geography in the eighth-grade program, giving greater attention to it in the earlier grades or working for more effective teaching of geography. That the principal of school A will seriously consider whether so much emphasis upon arithmetic is preferable to more emphasis upon the content subjects of American history and geography is hardly to be doubted. But she will also want to know what has been achieved in other schools, especially other schools in the same system.

City Schools Vary Widely in Achievement. The record of another school in the same large city school system will give a more typical set of educational findings. As the same series of tests were given in the same grades in this school as in school A the results are directly comparable. The class mental age for the sixth grade (Plate 2) coincides with the grade norm, just as in school A. The range of mental ages, however, stretches from 10 years 9 months to 15 years 5 months. Ten of the thirty-nine pupils are below the fifth-grade norm while six are above the seventh-grade norm. In school B the seventh grade differs hardly at all from the sixth grade in distribution of mental ages. The range is somewhat narrower and the class mental age slightly higher. But the grade label is the principal distinguishing feature. The little black triangle indicates that the eighth-grade class is a typical class half way through the eighth grade instead of at the end of it, as far as mental age is concerned. In range it covers nearly five whole grades. So great is the overlapping of grades that the interchange of the pupils in the top half of the sixth grade with those in the lower half of the eighth grade would make for greater homogeneity. In comparison with the corresponding classes in school A, the seventh and eighth grade classes are approximately a year younger or a whole grade below them in mental age. Surely the same grade label has very different meanings with respect to mental ages in these two schools. Much wider differences, however, are frequently found in the same school system.

A very pertinent question arises at this point in the description. Is the achievement of the seventh grade in school B higher than that of the sixth grade? As one compares the distances between each black square and each black circle for each phase of instruction, it is significant that the two classes are a year apart in spelling, about a year apart in reading, nearly two years apart in range of information in American history, half a year apart in the thought phase of it, more than a year apart in the information phase of geography, in the fundamental operations of arithmetic, and in arithmetic problems. In the thought phase of geography alone are the two classes as close together as they are in mental age. One wonders if the class label "seventh grade" may not be responsible for the higher achievement of the seventh-grade class. As one follows the black squares across Plate 2, the class scores for the sixth grade are seen to be below the mental-age norms of 52 in spelling, 50 in reading, 74 in American history, geography and the fundamental operations in arithmetic and 66 in arithmetic problems—in every phase of school work; they are more than a grade below in range of information in geography and more than three grades below in range of information in American history. In following across Plate 2 the black circles indicating the class scores, it is clear that in achievement the seventh grade is at or above its mental-age norms of 52½ in spelling, 51 in reading, 75 in American history, geography and the fundamental operations of arithmetic and 67 in arithmetic problems—in all phases of school work measured except the information and thought phases of geography and the information phase of American history. Although more than a year and a half below its mental-age norm in the information phase of American history, it is nevertheless two full years above the class score of the sixth grade. In the information phase of geography the class score is more than a year above the class score of the sixth grade even though the difference in class mental ages is but two months. In stressing the information phase of both American history and geography to overcome the gross deficiency in these elements in the sixth grade the thought side seems to have been sadly neglected, entirely so in the teaching of geography. Is this seventh-grade class made up of pupils who at some time have skipped a grade because of superior achievement? Has their better quality of work been taken into account in grouping them together? The wide overlapping in achievement with pupils of the sixth grade suggests that possibly the harder content and higher standards of the seventh grade may have been a factor in urging them on to more nearly normal achievement.

As one traces through the black triangles, designating the eighth-grade class scores on Plates 1 and 2, those for spelling, reading, the fundamental operations of arithmetic and arithmetic problems bear the same relation to the class mental ages in the two schools. In the information and thought phases of both American history and geography, however, the class scores of school B approximate the mental-age norms more closely—by nearly a grade. The eighth grade of school B is graduated a year younger mentally. In spelling ability, in reading ability and in arithmetic the class stands a year below that in school A. In the content subjects of American history and geography the two classes have nearly the same achievement levels in spite of their difference of a year in mental age. Surely such striking variations are too marked to pass unnoticed. The measurements show very clearly that in both city schools the few gifted pupils are retained too long in the elementary school. In school A the average eighth-grade pupils are not only retarded half a year but the work in the content subjects needs to be brought to a much higher level. In school B, on the other hand, the average eighth-grade pupils are graduated without attaining the eighth-grade achievement norms in any phase of instruction except arithmetic problems. Even though the work in the content subjects surpasses that in school A, it is still in need of somewhat greater emphasis.

What a Town School Principal Discovered Regarding the Achievement of His School. In organization both the town school and the consolidated school resemble the city schools. Do they also resemble them in achievement? This question can best be answered from a picture of what was discovered in town school C with the use of the same series of tests that were given in the city schools A and B.

The high sixth-grade class on Plate 3 resembles those on Plates 1 and 2 very markedly in range of mental ages. The class mental age or middle mental age of the class is somewhat more than half a grade lower than those in schools A and B. The seventh-grade class resembles that of school A in both range of mental ages and class mental age, while the eighth grade resembles that of school B. Between the sixth and seventh grades of school C there is a difference of nearly two years in the class mental ages but between the seventh and eighth grades there is a difference of only a half grade. Will corresponding differences be found among the class scores in the various phases of instruction?

In spelling the class scores are just a grade apart and all a half grade below the grade norms. The arrangement of the class scores in reading very closely resembles that of the class mental ages but each class score is a full grade or more below the score corresponding to the class mental age. In the information phase of American history the class scores are again approximately a grade apart but in this case they are two full grades below the scores corresponding to the class mental ages. While the eighth-grade class score in the thought phase of American history nearly coincides with the class mental-age norm, the class scores of the sixth and seventh grades are approximately a year below their respective grade norms. In both the information and thought phases of geography the seventh and eighth grades alike fail to attain even the sixth-grade norm. The low achievement of school C in geography parallels that in the two city schools. It, too, is evidently due to low achievement in the earlier grades and the dropping of its study at the end of the seventh grade. But may not the norms be too high? As they were based upon actual achievement over a fairly wide area they seem to represent present practice fairly well. In a recent survey of the achievement in geography in the schools of Kansas City the sixth-grade pupils made a mid score of 80 in the information scale and a mid score of 81 in the thought scale. These scores are almost identical with the seventh-grade norms of 80, as the Kansas City sixth grade corresponds very closely to the seventh grade on the distribution sheet. In arithmetic the achievement of the eighth grade very closely resembles that of the two city schools but not so in the sixth and seventh grades.

Except for geography and arithmetic problems the differences between the sixth-grade and eighth-grade class scores are very similar to the difference between the class mental ages of the two grades. This is much truer of school C than of school B and even truer of school C than of school A. In reading alone is this town school achieving decidedly less or decidedly differently than the two city schools. Like school B, it is graduating its pupils from the eighth grade before they reach the normal mental age and without attaining the eighth-grade achievement norms. The pupils are leaving with a less effective ability to read and a narrower range of information in American history than is the case in school B. These phases of instruction together with geography are in need of serious attention in school C.

In all three schools a few tendencies stand out prominently. There is an unevenness of emphasis from one phase of school work to another. The information phase of American history and both the information and thought phases of geography receive entirely too little attention, especially below the seventh grade. There is obviously too wide a variability in achievement within any class as well as too great an overlapping of achievement from grade to grade. A more adequate classification of the pupils will do much to relieve these tendencies. A more adequate stimulus for the pupils whose work is poor in quality will still further improve the teaching situation. But the discovery of the existing state of affairs is essential for any effective improvement. Once an efficient series of mental tests and educational scales have been selected, given and scored—and they can be used in place of the usual examinations without any loss of time and with but a small expense—the tabulation of the scores on a distribution sheet and the finding of the class scores requires but a slight amount of effort and yields some very significant information.

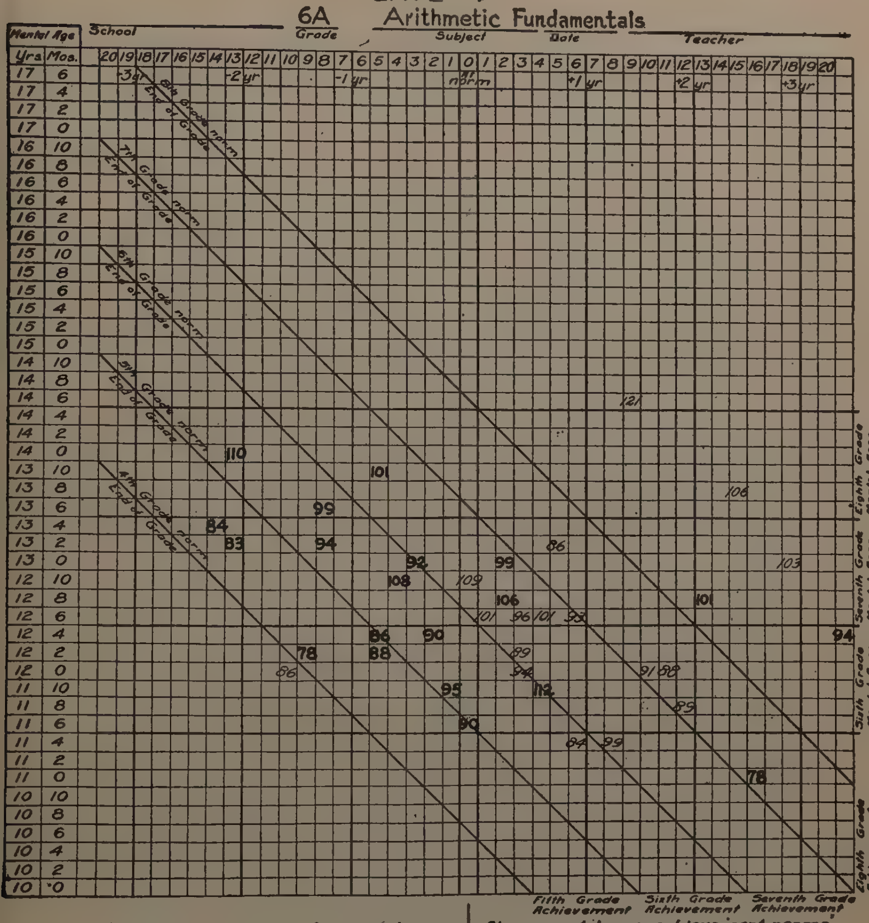
CHAPTER II

DISCOVERING THE CONDITIONS OF INSTRUCTION IN THE CLASSES

The Principal Needs to Use Educational Measurements in His Supervisory Capacity. The school principal is not only responsible for the achievement of his school but for the conditions of instruction as well. In his supervisory capacity he is expected to become intimately acquainted with the work of each class. Even this acquaintance is commonly limited to a subjective evaluation of the work of the teacher. It possesses little of the quantitative exactness of the attendance records and recitation schedule although it is far more important than either. It is important to know what the classes as units are achieving in each phase of school work, but it is still more important for the principal to know what each individual pupil is achieving in relation to the rest of the class. To know which phases of instruction are receiving the least emphasis in each class is essential for effective supervision. It is just as essential, however, for the supervisor to find out whether the teacher is holding the girls and boys up to the same standard of work. Quite as significant is the discovery whether the teacher's attention is centered primarily on the gifted, average or less gifted pupils in the class. These are insights which cannot be gained from the teacher's marks nor from frequent observations of the class. They are conditions of which the teacher is seldom aware. With but little extra work in tabulating the educational measurements these instructional conditions can be made as obvious as the relations of the class scores on the distribution sheet previously used.

The Results of Educational Measurements May Be Readily Tabulated to Show the Instructional Conditions in a Class in Arithmetic. On the next few plates the pupils' achievements in the educational scales are tabulated to show their quality of

PLATE 4



CLASS RECORD CARD - B

The numbers in italics indicate intelligence quotients of girls; those in heavy type indicate intelligence quotients of boys.

work[1] as well as their grade attainment. The number nearest to the top of the plates, the 121 in italics, is the identification number of Ella D. It is her intelligence quotient or the ratio that is obtained by dividing her mental age of 14 years 7 months on a Terman mental test by her chronological age of 12 years. It indicates her normal rate of achievement as compared with children of average intelligence. It is written in the row with 14-6 at the left because the 14-6 refers to children with mental ages of 14 years 6 months and 14 years 7 months. It is also located in the ninth little square to the right of the pair of heavy vertical lines down through the center of the plate. In the fundamental operations of arithmetic she made a score of 96. This is 9 points above the norm for a pupil of her mental age. The entry is thus made from the child's mental age and the difference between her achievement score and the score most frequently made by pupils of her mental age.

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[1] By quality of work is meant the relation of a pupil's achievement to his capacity to achieve; not the extent of his attainment but the extent to which his attainment approximates the attainment of other pupils of his mental age. For a gifted pupil a high achievement attainment

When a pupil's identification number or intelligence quotient is located between the pair of heavy vertical lines with "At norm" at the top it indicates that the pupil is doing an average quality of work. All numbers to the right of this column indicate a quality of work better than average or achievement attainments above the mental-age norms, while those at the left of it indicate a quality of work below the average. For a pupil of average intelligence the spaces between the other pairs of vertical lines are equivalent to a year's achievement in school. Ella, of course, should achieve one and two-tenths as much as the average pupil, while George S, whose intelligence quotient of 78 appears in the lower right hand corner of the plate should be expected to achieve only eight-tenths as much as the average pupil. The fact that his intelligence quotient is so much farther to the right of the "At norm" column than Ella's shows that in the fundamental operations of arithmetic he did an even better quality of work than she did.

The heavy horizontal lines across the plate designate the grade mental-age norms for the end of the grades. The top one shows that the normal mental age for pupils at the end of the eighth

that fails to come up to the average attainment of other pupils of his mental age is evidence of a poor quality of work. On the other hand, a much lower attainment of a less gifted pupil is an indication of a good quality of work if it surpasses the average attainment of pupils of his own mental age. Quality of work is thus a measure of the quality of a pupil's mental activity rather than of its products.

grade is 14 years 6 months. The bottom one likewise indicates that 11 years 6 months is the normal mental age for completing the fifth grade and entering the sixth. As Ella's 121 is just above the eighth-grade mental-age line she is mentally as mature as the average pupil completing the eighth grade. Why then is she just completing the sixth grade along with George who has a mental age below that of the average fifth-grade pupil at the end of the grade? Perhaps her achievement record is low. This, too, is shown on the plate.

The first heavy oblique line from the top of the plate indicates that any pupil whose intelligence quotient falls on it is doing as well as the average eighth grade pupil at the end of the grade. The lowest heavy oblique line—the one with "4th Grade norm" on it indicates that the two pupils whose intelligence quotients fall on it made the same achievement record that is expected of an average fourth grade pupil at the end of the year. In achievement in the fundamental operations of arithmetic Ella is at least a year beyond the eighth-grade norm. George is doing seventh-grade work in spite of his fifth-grade mental age.

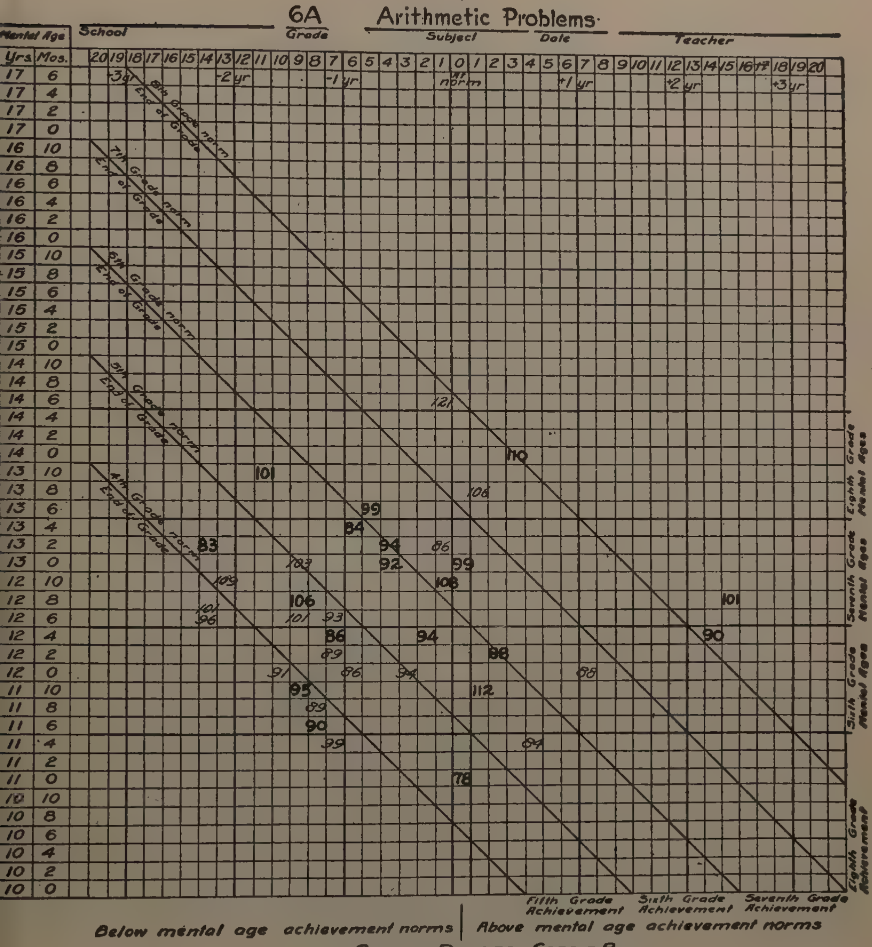
But the plate is intended rather to show the relations of the achievement and quality of work of each pupil to that of the rest of the class. In quality of work Ella stands in the top quarter of the class. George is in the top tenth. Only one girl and one boy surpass him. The intelligence quotients of the girls are in italics, those of the boys are in bold faced type. In achievement Ella is surpassed by only one girl. George is surpassed by several girls but by only two boys. Some other striking facts about this sixth-grade class are revealed to the principal by Plate 4. The variations in quality of work are very wide. The numbers stretch from one side of the plate nearly over to the other side. More striking is the fact that there are only six numbers in bold-faced type in the right half of the plate and only one number in italics in the left half. In quality of work the girls as a group are far surpassing the boys; their scores surpass their mental-age norms in most cases while the scores made by most of the boys fall below the norms for their mental ages. Furthermore, only six of the numbers in bold faced type are above the oblique sixth-grade norm line. All but two of the numbers in italics are on or above this sixth-grade norm line. Only six of the boys are doing better than sixth-grade achievement in the fundamental operations of arithmetic. Only one girl has failed to attain the sixth-grade norm for the end of the grade. Do the girls need to know more about the fundamental operations in arithmetic than do the boys? Why then has the teacher allowed the boys to fall so far below the girls? She probably did not know it. The supervisor has something definite and concrete to show the teacher in place of the usual vague advice only half believed by either.

As a consequence of the wide variation in quality of work the achievement of the class ranges from fourth-grade attainment to ninth-grade attainment. Nor can this condition be laid to the variation in the mental ages of the pupils. With but few exceptions the mental ages fall between the fifth-grade and seventh-grade horizontal norm lines. This situation will be a serious one for the seventh-grade teacher of this class to meet. But she too might not discover it. Perhaps this condition existed at the beginning of the sixth grade. At least the principal can point it out to the seventh-grade teacher who takes this class for instruction.

In arithmetic problems (Plate 5) the situation is somewhat reversed. Except for a couple of boys the range in quality of work is very much narrower. Very few pupils are doing a quality of work above the average. The class is nearly a year below an average quality. The girls are doing even worse than the boys. Three of the boys make an eighth-grade achievement record. Only one other boy is surpassing the sixth-grade norm in achievement. Several are below the fifth. Among the girls only five surpass the fifth-grade norm and Ella alone reaches the eighth-grade norm. Why should these girls do so much poorer work in problem solving than in the fundamental operations? This is another problem worthy the attention of the supervisor.

In Spelling and Reading Decidedly Different Instructional Conditions Are Evident. On Plate 6 most of the numbers are between the fifth-grade oblique norm line and the seventh-grade oblique norm line. Only five cases lie decidedly outside these limits and only two cases are more than half a grade beyond them. In spelling, just as in the fundamental operations of arithmetic, there is a distinct though less pronounced sex difference. The greater proportion of the numbers in italics are in

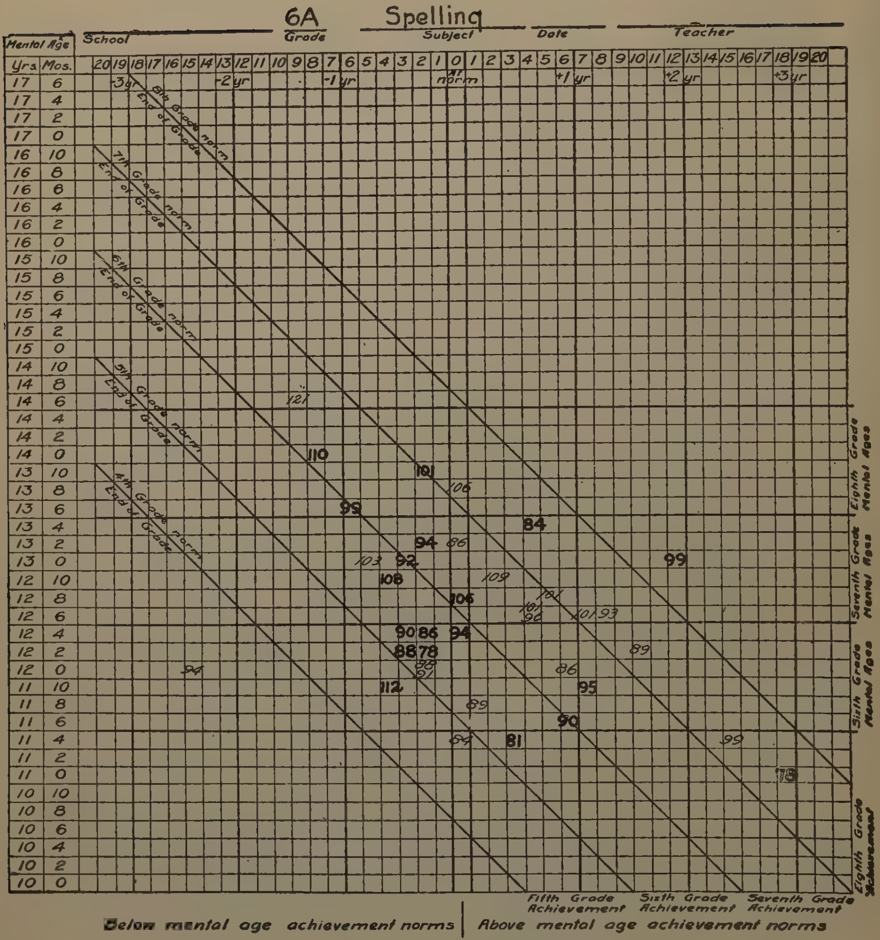
PLATE 5



CLASS RECORD CARD - B

the right half of the plate and tend to center around the seventh-grade oblique norm line. Most of the numbers in bold-faced type are located at the left of the "At norm" column and tend to cluster around the sixth-grade oblique norm line. In both achievement and quality of work the girls are fully half a grade in advance of the boys. Another peculiar feature about the plate is the clustering of the numbers around the oblique grade-norm

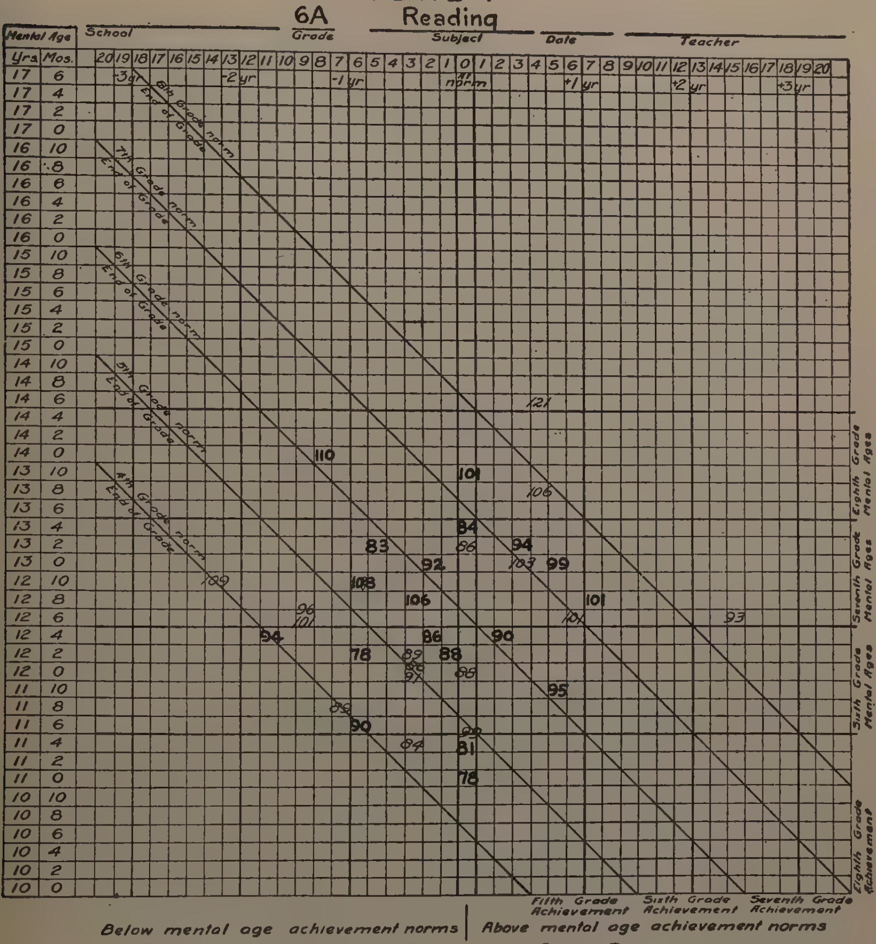
PLATE 6



CLASS RECORD CARD – B

lines. With but few exceptions the mentally younger pupils of each sex are reaching the same achievement level as the mentally older pupils. There seems to have been a distinct tendency to stimulate the pupils to attain the same grade level rather than a uniform quality of work. Even Ella, the gifted girl, can spell less well than many of the girls less mature mentally. She is actually surpassed a full grade by George. A uniform grade level of attainment is commonly stressed and desired in school achieve-

PLATE 7



CLASS RECORD CARD - B

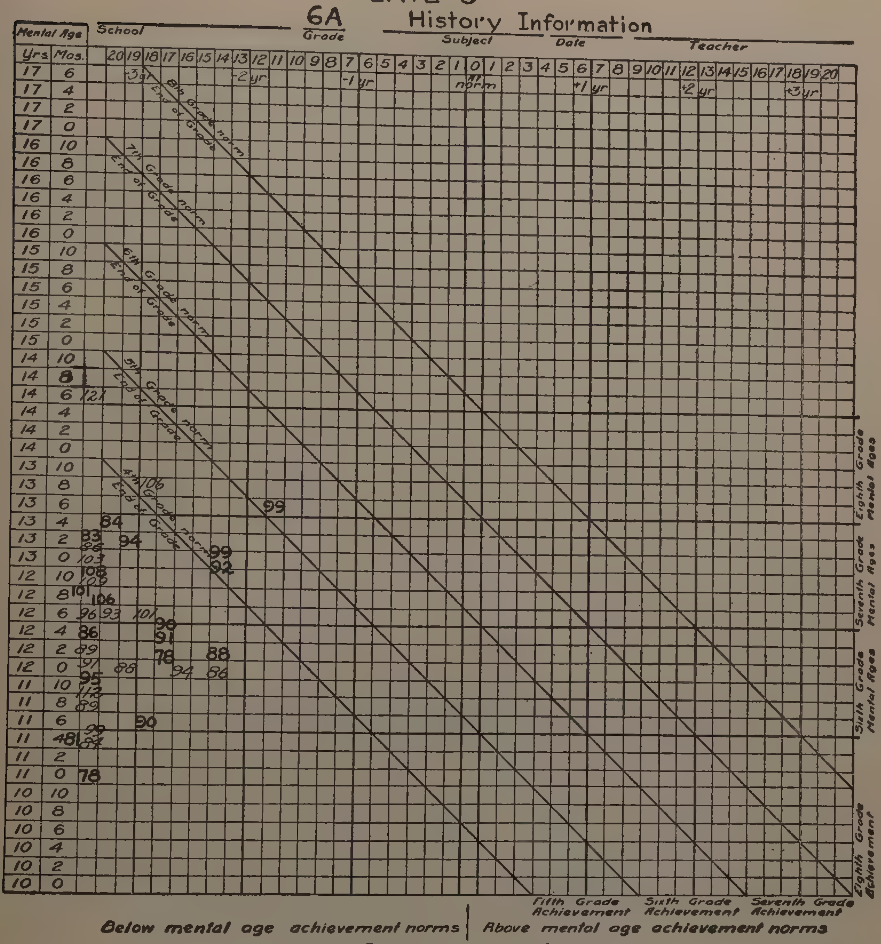
ment, but unless the pupils are well classified according to their capacity to achieve this tendency can have but an undesirable outcome. The less gifted pupils will be held to a high quality of work while the mentally older pupils will be allowed to develop ineffective methods of study and inefficient habits of work.

This tendency to insist on the attainment of the grade level is not at all evident in reading for comprehension (Plate 7).

Just as in spelling, the quality of work of the class as a whole is fairly evenly distributed around the "At norm" column. It is also confined within a rather narrow range on either side of the "At norm" column. In actual achievement the pupils range from fourth-grade reading ability through eighth-grade reading ability. Among the girls a superior quality of work characterizes the reading of the mentally older pupils while an inferior quality of work is characteristic of that of the mentally less mature pupils. While this is preferable to the neglect of the more mature pupils, especially as it tends to offset the opposite tendency in spelling, an even quality of work for all the pupils is more desirable in the long run. The overstressing of one phase of work for any group of pupils is frequently accompanied by the neglect of some other phase.

How Seriously the Content Subjects May Be Neglected Is Striking Indeed. The next plate, No. 8, is a striking example of a want of proper emphasis on one phase of instruction. Only one pupil, the boy with a mental age of 13 years 6 months and intelligence quotient of 99, has even a fifth-grade range of information in American history and comes within two years of an average quality of work. Only four more pupils have even a fourth-grade range of information. The numbers of more than half the pupils lie in the column outside the 20 at the left of the plate. This means that their scores were more than twenty scale points or more than three full grades below the norms for their mental ages. This is a situation calling for more drastic remedial work than the mere pointing it out to the sixth-grade and seventh-grade teachers. It is a clear indication that the principal has been unacquainted with what has not been happening in the lower grades. The sixth-grade teacher is not alone responsible for this situation. The principal himself is even more so. As a supervisor it is one of his functions to see that no phase of school work is neglected. Even an undue amount of emphasis during both the seventh and eighth grades will fail to bring these pupils up to a normal range of information in American history. Perhaps a wider range of information is commonly acquired than is socially useful. At least the principal of this school may have thought so. But the chances are much in favor of his never having given much thought to it. Neither arithmetic, spelling,

PLATE 8

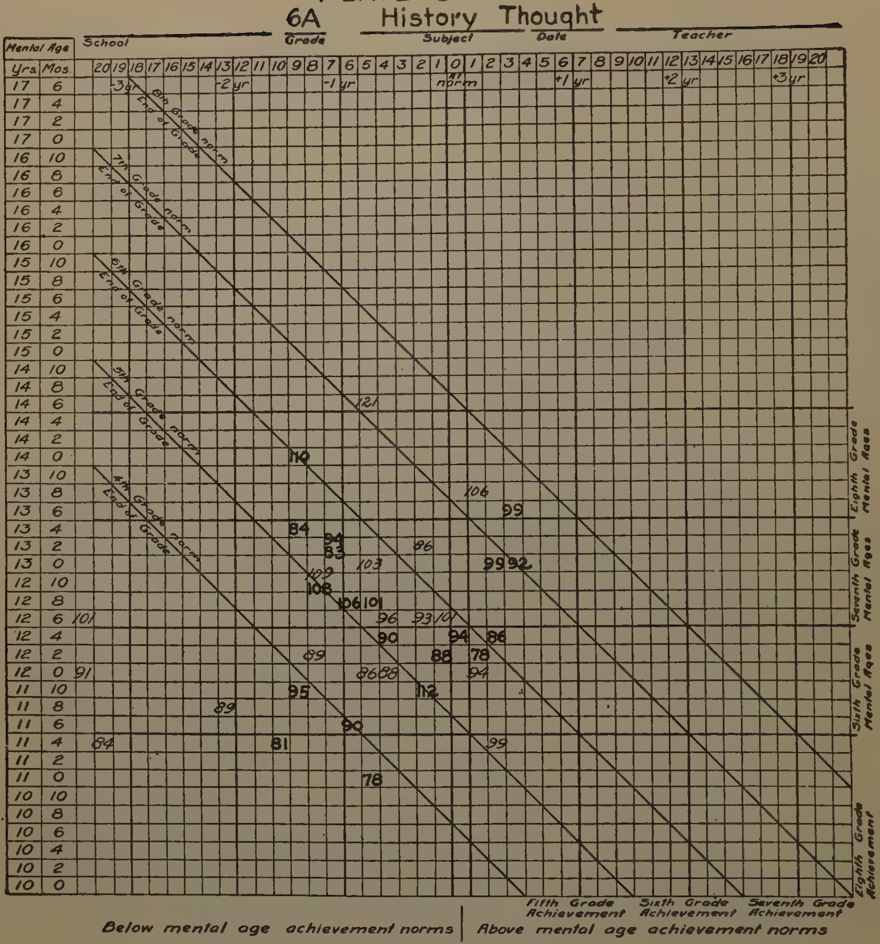


CLASS RECORD CARD - B

nor reading have been overemphasized at the expense of a normal range of information in American history.

The thought phase of American history is frequently overemphasized at the expense of the information phase. Perhaps that has happened in this school. A single glance at Plate 9 allays any such hopes. The situation is vastly better than in the information phase. Yet only half a dozen pupils surpass the

PLATE 9

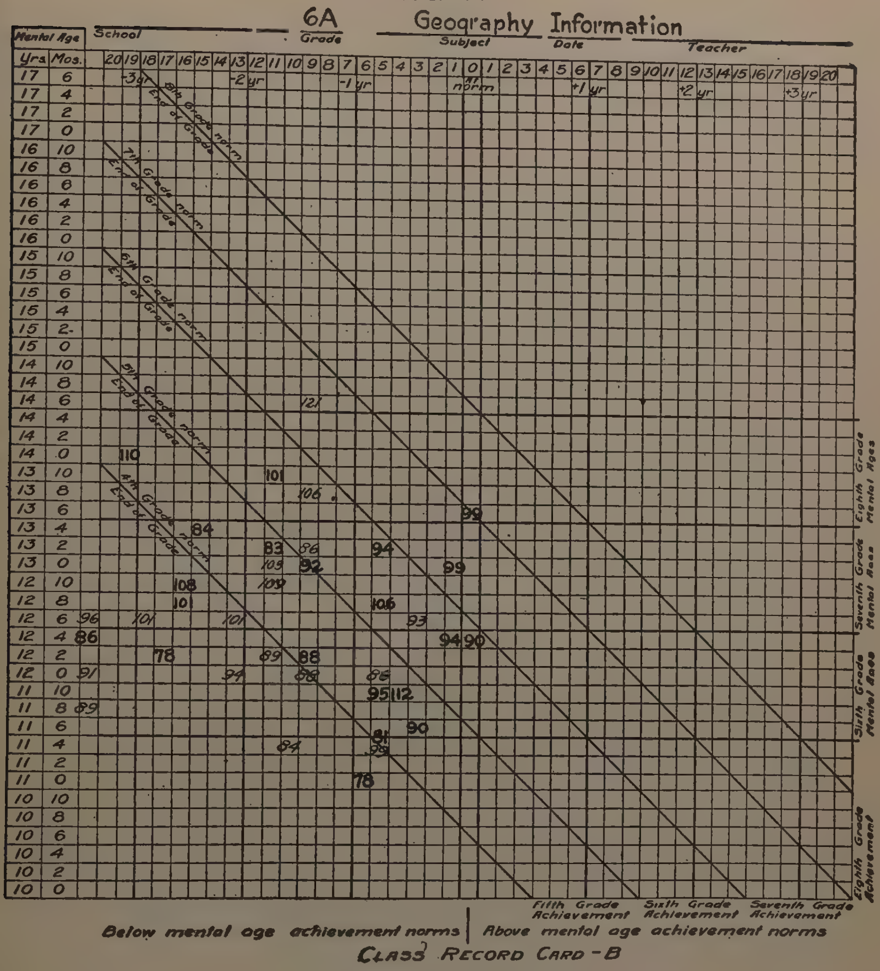


CLASS RECORD CARD - B

sixth-grade achievement norm while eight fail to reach or surpass the fourth-grade norm. In quality of work very few are above the average. Except for the few girls doing an extremely poor quality the range in quality of work is favorably narrow.

In geography the conditions are similar in the information and thought phases (Plates 10 and 11). In both the quality of work is fully a year below the average. The range of information in American history was surely not neglected for the study of

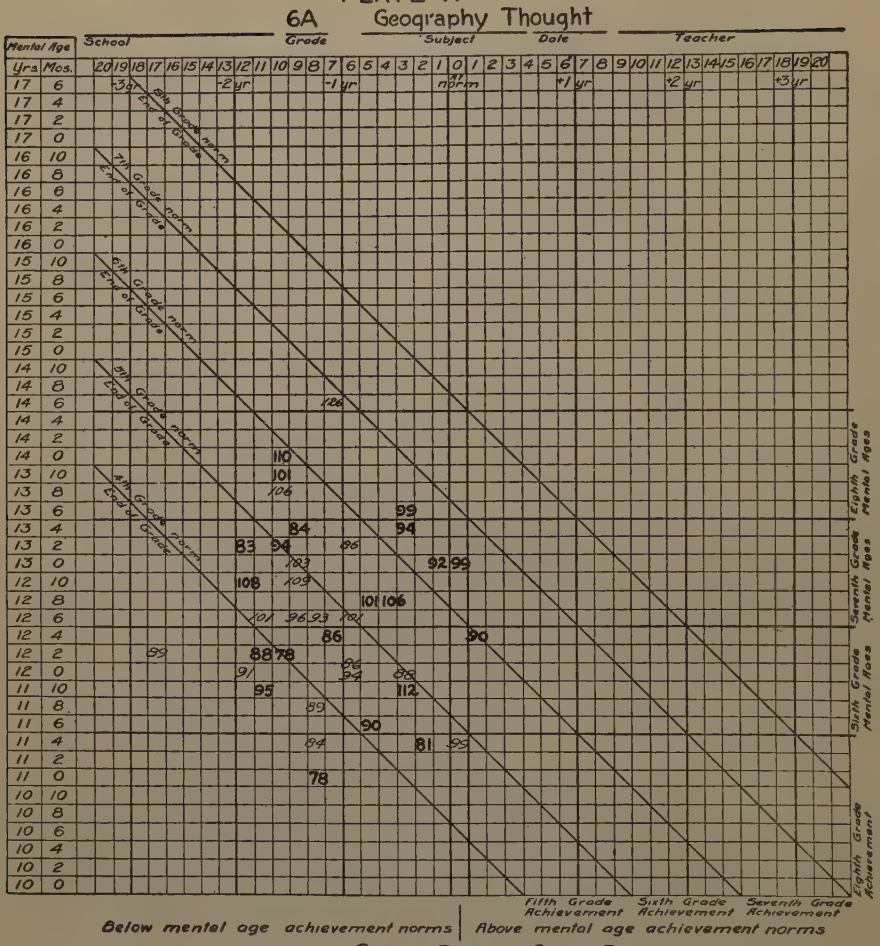
PLATE 10



The numbers in italics indicate intelligence quotients of girls; those in heavy type indicate intelligence quotients of boys.

geography. Although these pupils will continue the study of geography only during the seventh grade, only half of the boys and less than half of the girls have reached the fifth-grade norms in either phase of the subject. Among the girls Ella alone surpasses the sixth-grade norm in both phases. Only two other

PLATE II



CLASS RECORD CARD - B

girls surpass the sixth-grade norm on either plate. In quality of work the girls are below the boys in either phase of geography. It is questionable that the girls need to spell better than the boys and very doubtful that they should have a markedly better knowledge of the fundamental operations of arithmetic. That girls do not need as wide a range of information in geography or that they should not have as much ability to solve problems involving geographical information as boys is not likely to be seriously advocated by any educationalist. Nor is there any conclusive evidence that they have not just as much capacity for acquiring information or the ability to solve problems in geography.

The principal of this school needs also to be aware that the content subjects of both American history and geography have been grossly underemphasized. While reading may be as important as either, their neglect for spelling and arithmetic may be seriously questioned. Through such an analysis as may be made from these plates the principal can acquire some very definite and significant data on the basis of which he may assist the sixth-grade and seventh-grade teachers to make some effective changes in their teaching practice. The same data are equally significant for evaluating the achievement of his school and for initiating several much needed innovations. The same changes should not be undertaken in any other school except on the basis of a similar measurement program. This, however, would be likely to reveal some strikingly different conditions to deal with.

152

99
53
[illegible]

CHAPTER III

THROUGH EDUCATIONAL MEASUREMENTS THE PRINCIPAL MAY BECOME BETTER ACQUAINTED WITH HIS PUPILS

The Principal Is Also Responsible for the Individual Pupils. Even the final placement of each pupil, his retention or promotion, is also one of the principal's functions. For most of the pupils he accepts the teachers' recommendations. In the case of the backward pupil, however, the teacher frequently acquaints the principal with the pupil's work and leaves this decision to his judgment. But usually this decision is greatly influenced by, if not largely based upon, the subjective observations and standards of the teacher. The case of George S, whose intelligence quotient of 78 appeared at the bottom of all the plates in chapter 2, is an example. In everything except the fundamental operations of arithmetic and spelling he seems to the teacher to stand very close to the bottom of the class and even in these subjects he is so slow in his work that she is not at all sure of his achievement. He is chronologically 14 years 2 months old. He has already repeated a grade and a half. Shall he be retained in the sixth grade for another half year or sent along to the next higher grade. The teacher feels that he is indolent. Retention might wake him up and be his salvation. Could the principal but have such a record of George's work as that on Plate 12 he would hesitate before confirming the teacher's recommendation.

In the top row of little squares on this plate are letters or figures denoting the mental and achievement tests which George has recently taken with the rest of the sixth-grade class. The diagonal arrangement within each large square is to facilitate comparisons of the same items from one phase of school work to another or from one testing time to the next. The scores he made in each test are recorded in the second row of little squares. Thus, in the Terman Group Test of Mental Ability, Examination

PLATE 12

Name S........, George Sex M 5 6 7 8 9 BA BA BA BA BA Grade Born Jan. 25, 1911 Mo. Day Yr. Age 14—2 Yr. Mo. on May 1 Date 1925

Parent or Guardian Address Telephone Occupation

Born Where? U.S.		Intelligence					Intelligence					1. Spelling					2. Reading, Th.-McC					3. Reading					4. History Information					5. History Thought				
Nationality of Father German Mother German Years in school before entering–grade 6, k'g'n not included..........		Test	Score	Men. Age	Grade Var in months	Men. Q.	Test	Score	Men. Age	Grade Var in months	Men Q.	Scale	Score	M.A. Var. x 1½*	Grade Var x 1½*	Ach. Q.	Scale	Score	M.A. Var. x 1½*	Grade Var x 1½*	Ach. Q.	Scale	Score	M.A. Var.	Grade Var	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale,	Score	M.A. Var.	Grade Var.	Ach. Q.
Grade	Test	TA										A2					4										R1					R2				
6A	Score		31										58½					44										40½					60			
Date May 1925	M.A. Var.			11-1										+18					0										+25					+5½		
Age	Grade Var.				14										+10½					+8½										+33					-13½	
14—2	Quotient					78										127					100										63					91
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

		6. Geography Information					7. Geography Thought					8 Arithmetic Add.Subt.Mult.Div.					9. Arithmetic Add.Subt.Mult.Div.					10. Arithmetic Problems					11. Vocabulary					12. Handwriting				
		Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	Grade Var.	Rate	Grade Var.
Grade	Test	R1					S1					R2										I2														
6A	Score		59½					57					82										58													
Date May 1925	M.A. Var.			+6					+8½					+16½										+½												
Age	Grade Var.				-14					-16½					+8½										-7½											
14—2	Quotient					91					89					125										100										
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
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	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

A, he made a score of 31, in the Van Wagenen Spelling Scale A, Division 3, a score of 58½, in the Thorndike-McCall Reading Scale, Form 4, a score of 44, and so on in history, geography and arithmetic. In deciding what to do with George these scores have no special significance. Were they merely recorded on the usual class record sheets or even on an ordinary individual card they would stand but little chance of being consulted at all. In the third row of little squares, however, are some items that are of great significance. In the first large square is the entry 11-1, indicating that the 31 in the mental test is equivalent to a mental age of 11 years 1 month. The —14 in the next square below shows that George is mentally 14 months too young for his grade location. This might at once settle George's fate were it not for the 14-2 under "age" in the column at the left and the 78 in the lower right hand little square under "Intelligence." That he is over fourteen years old and that his normal rate of achievement is only about eight-tenths as rapid as that of normal children are both important facts to take into account in deciding upon what to do with George. Quite as important are the numbers in the other middle little squares. They are the differences between George's scores in the scales and the scores most frequently made by other children of George's mental age. The fact that a difference of six points is equivalent to the gain made by a pupil of average intelligence during a school grade makes these differences even more significant. In spelling George is 18 points or three grades beyond his mental age. He is doing normal work in reading. In the fundamental operations of arithmetic he is more than two and a half grades in advance of his norms and in arithmetic problems is making normal progress. In American history and geography his scores are at least a year below his mental-age norms, in the information phase of American history several years below. But this is not surprising as the whole class were equally as far below their mental-age norms in both American history and geography. In these two subjects his achievement is below that of a fourth-grade level. The numbers in the fourth row of little squares are all larger than 6 and all but two have a minus sign in front of them. They represent the differences between George's scores and the norms for the end of the sixth grade. In reading and arithmetic problems he is more than a year below his grade location even though his achievement quotients of 100 and 101 in these subjects indicate a normal quality of work. In both spelling and the fundamental operations of arithmetic he is doing considerably better than seventh-grade work. His achievement quotients of 127 and 125 in these subjects indicate that he can spell about one and a quarter times as difficult words and can do about one and a quarter times as difficult tasks in arithmetic as the average child of his mental age. The achievement quotients are ratios similar to the intelligence quotients only they are found by dividing the pupil's educational age in a subject by his mental age.

With all this information available regarding George's work the principal is going to decide to promote George to the seventh grade. He doesn't belong there in either capacity or achievement. In spelling and the fundamental operations of arithmetic alone is he equipped to make progress in the seventh grade. And these will be the only phases of school work where he will make much progress. Even though the knowledge may not be of much worth to him he will spend most of his effective effort on these subjects. He will maintain his good attitude toward school work even though the content in geography and history may be too difficult for him to comprehend much of it. Yet he would probably do no better if retained in the sixth grade and he might well become discouraged and cease to try if no recognition is given to his excellent quality of work in spelling and the fundamental operations of arithmetic.

Can a Reasonable Adjustment Be Made of Such Misfit Children as George? Sending him on is but postponing the crisis. Retaining him in the sixth grade may work incalculable harm to him. A careful analysis of the record cards of the pupils whose situations resemble that of George, and there are a fair number in each grade, will convince the principal that the organization of his school is not at all well adapted to take care of such pupils. It never has been, only the cases do not seem at all striking until their quantitative measurements are squarely faced.

But George's case is not the only one in need of careful consideration. Ella, whose intelligence quotient of 121 appeared nearest the top of the plates in Chapter 2, is quite as much in need of the principal's serious attention. But why? The teacher

PLATE 13

Name D........., Ella **Sex** F 5 BA 6 BA 7 BA 8 BA 9 BA Grade **Born** April 15, 1913 Mo. Day Yr. **Age** 12—0 Yr. Mo. **on** May 1 1925 Date

Parent or Guardian **Address** **Telephone** **Occupation**

Born Where? U.S.
Nationality of Father Am. Mother Am.
Years in school before entering grade 6, k'g'n not included..........

		Intelligence					Intelligence					1. Spelling					2. Reading, Th-McC					3. Reading					4. History Information					5. History Thought				
		Test	Score	Men. Age	Grade Var in months	Men. Q.	Test	Score	Men. Age	Grade Var in months	Men Q.	Scale	Score	M A Var. x 1½*	Grade Var x 1½*	Ach Q	Scale	Score	M.A. Var x 1½*	Grade Var x 1½*	Ach Q	Scale	Score	M.A. Var.	Grade Var	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q	Scale	Score	M.A Var.	Grade Var.	Ach. Q.
Grade 6A	Test	7A										A2					4										R1					R2				
Date	Score		105										54					62										62½					81			
May 1925	M.A. Var.			14-7										+9½					+4½										-24					+5½		
Age	Grade Var.				+26										+3½					+18½										+11					+7½	
12 —0	Quotient					121										89					105										72					93
Grade	Test																																			
Date	Score																																			
	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
Date	Score																																			
	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
Date	Score																																			
	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

		6. Geography Information					7. Geography Thought					8 Arithmetic Add.Subt Mult Div.					9. Arithmetic Add.Subt.Mult.Div.					10. Arithmetic Problems					11. Vocabulary					12. Handwriting				
		Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	Grade Var.	Rate	Grade Var.
Grade 6A	Test	R1					S1					R2										I2														
Date	Score		77					79					96										77													
May 1925	M.A. Var.			-½					+7½					9½										-1½												
Age	Grade Var.				+3½					+5½					+22½										+11½											
12 —0	Quotient					89					91					111										98										
Grade	Test																																			
Date	Score																																			
	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
Date	Score																																			
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Date	Score																																			
	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

is unlikely to bring her case up for discussion. She has done so well that there can be no question concerning her promotion. A careful examination of her record card may raise some questions, however. As given on Plate 13, she has a mental age of 14 years 7 months, an intelligence quotient of 121, and a chronological age of 12 years. Mentally she is a month older than the average pupil completing the eighth grade. Even though she is only 12 years old she has at least eighth-grade scores in reading, in the fundamental operations of arithmetic and in arithmetic problems, and seventh-grade scores in the thought phases of American history and geography. (The grade variations in the fourth row of small squares are about +12 or above in the first three of these phases of instruction and about +6 or above in the last two.) Were it not for the fact that the whole class stood about a year below the sixth-grade norm in these phases of school work, she would probably have attained the eighth-grade norm in these also. In spelling and the information phase of geography she lacks about half a grade from reaching the seventh-grade norms, but in spelling (Plate 6) the mentally older pupils were all allowed to slump, while in geography (Plates 10 and 11) she is a year in advance of the next best girl in the class and is surpassed by but one boy in the information phase and by no boys in the thought phase. Even in the information phase of American history (Plate 8) she is surpassed by only one boy. In reading and arithmetic her achievement quotients are approximately normal or above. In the other phases of instruction they are around 90 except in the information phase of history. What is surprising about Ella's achievement quotients is that they are so nearly normal when she is so grossly misplaced in the sixth grade. The question in her case is not whether she should be promoted but how much should she be advanced. If she is promoted to the eighth grade she will graduate at 13 and will know considerably less about spelling, American history and geography than a child of her capacity should know. She will enter high school mentally younger than the other students with the same rate of achievement or intelligence quotient. If she is promoted only to the seventh grade along with the rest of the class she will be lacking in adequate stimulation, which is still worse. Again the school principal is awakened to the fact that the organization of his school is as greatly in need of modification to meet the needs of the gifted pupils, of whom there are more than one in the other grades, as to meet the needs of the less gifted. It is organized to meet the needs of the average pupils only. These measurements have demonstrated that in several respects it is in need of more quantitative supervision to meet even their needs.

The Principal Has Many Needs for Quantitative Information Concerning Each of His Pupils. Their proper classification into homogeneous instructional groups is almost wholly dependent upon it. For this purpose the pupil's mental age and normal rate of achievement are far more important than his chronological age. Whether the pupil is working at his grade level, significantly above it, or markedly below it are also of marked interest to the principal. However important may be a pupil's achievement relations to the rest of the class—whether he is near the top or near the bottom in achievement or quality of work—the actual extent to which he is approximating his capacity to achieve—whether he is doing a poor, average, or good quality of work—is of still greater importance to the principal who is vitally interested in the intellectual welfare of his pupils. Even more significant to the principal is the knowledge that a pupil is improving or deteriorating in his quality of work. Not only does the principal need to have this information available in such form that he can keep in constant touch with the changes that the classes and pupils are undergoing but there are occasions when its immediate availability is of extreme importance.

The mother of Fannie D comes to the principal for advice as to whether her daughter, who will soon complete the eighth grade, should take a college preparatory course in high school or a domestic science course. The principal may recall how the girl looks but this will not help him greatly in aiding her mother to make a wise choice. Fannie's mother might be told about the peculiar merits of each course. But this is not the information she is seeking. She wants to know which course Fannie is better fitted to take up. The principal of school D has a complete record of Fannie's measurements that were made at the middle of the seventh grade and again at the middle of the eighth grade. When he glances through her card, which is given on Plate 14, he notes that in the two mental tests which had been given

PLATE 14

Name D......., Fannie **Sex** F 5 BA 6 BA ~~7~~ BA ~~8~~ BA 9 BA Grade **Born** Nov. 20, 1911 (Mo. Day Yr.) **Age** 12 — 6 (Yr. Mo.) **on** May 25 19 24 (Date)

Parent or Guardian **Address** **Telephone** **Occupation**

		Intelligence					Intelligence					1. Spelling					2. Reading, Th.-McC					3. Reading					4. History Information					5. History Thought				
Born Where? …………………… Nationality of Father …… Mother …… Years in school before entering grade 6, k'g'n not included……….		Test	Score	Men. Age	Grade Var in months	Men. Q.	Test	Score	Men. Age	Grade Var in months	Men. Q.	Scale	Score	M.A. Var. x 1½*	Grade Var x 1½*	Ach. Q.	Scale	Score	M.A. Var. x 1½*	Grade Var x 1½*	Ach. Q.	Scale	Score	M.A. Var.	Grade Var	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.
Grade 7B	Test	7A										A3					2										52					R2				
Date	Score		63										54½					55+										56½					75+			
May 1924	M.A. Var.			12-7										+3					+6½										-18					+½		
Age	Grade Var.				+1										+½					+3½										-20½					+2	
12 — 6	Quotient					100										104					108										77					100
Grade 8B	Test	7B										B3					4										R2					R2				
Date	Score		84										60					53										71½					82½			
May 1925	M.A. Var.			13-7										+5					+2										-9					2		
Age	Grade Var.				+1										+3					+5										-11½					-½	
13 — 6	Quotient					100										106					97										89					102
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

		6. Geography Information					7. Geography Thought					8 Arithmetic Add.Subt.Mult.Div.					9. Arithmetic Add.Subt.Mult.Div.					10. Arithmetic Problems					11. Vocabulary					12. Handwriting				
		Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	Grade.Var.	Rate	Grade Var.
Grade	Test	52					R2															I3														
	Score		62½					61															53													
Date	M.A. Var.			-12					-13½															-13½												
Age	Grade Var.				-14½					-16															-16											
—	Quotient					84					82															82										
Grade	Test	R2					R2					R3										II3														
	Score		66					66					75										80													
Date	M.A. Var.			-14½					-14½					-5½										+7½												
Age	Grade Var.				-17					-17					-8										+4											
—	Quotient					82					82					93										109										
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

Fannie, she is an average pupil in intelligence with an intelligence quotient of 100. Her grade location is half a year in advance of both her chronological and mental age. Somewhere she must have been given a double promotion. In following through the lowest row of little squares in each half of the card he finds that some of her achievement quotients are above 100 but that more of them are below. On the whole her achievement quotients were somewhat higher at the middle of the eighth grade than at the middle of the seventh grade. The quality of her work has obviously improved. In examining the numbers in the fourth row of little squares in the second row of large squares on each half of the card he finds a

+ 5 for spelling
— 2 for reading
— 18 for history information
+ ½ for history thought
— 14½ for geography information
— 14½ for geography thought
— 5½ for the fundamental operations of arithmetic
+ 7½ for arithmetic problems.

Since a difference of six points is equivalent to a year's achievement for Fannie, she is likely to complete the eighth grade about a year in advance of the eighth-grade norms in spelling and arithmetic problems, about at the norms in reading and the thought phase of American history, about a year below in the fundamental operations of arithmetic, and more than two years below the eighth grade norms or less than a sixth-grade pupil in range of information in both American history and geography and in the thought phase of geography. The few seconds that it takes him to glance through her card give him a better basis for advising Fannie's mother to select the domestic science course for her daughter than calling all her former teachers into consultation.

The tests were given in place of the usual final examinations. It took no longer to give them than to give a series of ordinary class-room tests and but little if any longer time to score them. With some one to read off the pupils' names and test scores, the facts about each pupil, the designations of the tests used and the scores made by the pupil can be entered on these cards for a class of thirty pupils in about an hour. The mental-age variations and grade variations as well as the intelligence quotients and achievement quotients can be determined from a norm sheet and an age and quotient chart and also entered on each card by a competent clerk in from five to seven minutes. From the mental ages, mental-age variations and the intelligence quotients on these cards the class record cards used in Chapter 2 can be very easily and quickly filled in for a class. From the scores in the second row of little squares the distribution sheets used in the first chapter can be even more readily made out.

As Margaret L goes past his door the principal recalls that in the measurements made at the end of the sixth grade she was doing barely sixth grade work in spite of an advanced mental age. He selects her card (Plate 15) to see what changes in her work have taken place during the seventh grade and also to see whether an extra promotion would seem advisable. The second mental test confirmed the intelligence quotient on the first test. In half the cases they are likely to change more than two points. Margaret is evidently a superior child in intellect. Her chronological age of 13 instead of 13 years 6 months at the end of the seventh grade indicates that at some point in her school career she skipped a half grade. As her test scores at the end of the sixth grade are compared with those at the end of the seventh grade, it is evident that in spelling and reading more than a year's gain of 6 points was made since the differences of 4½ and 5 points in the case of spelling and reading are equal to gains of 6½ and 7½ points as compared with the normal gain of six scale points. (The unit of measurement in the spelling and reading scales is one and a half times as large as it is in the other scales.) As Margaret's normal rate of achievement is 1.14 times as rapid as that of an average pupil she should gain nearly seven points during the year's work. In spelling and reading she does. In the information phase of American history she gains only two points but in the thought phase she makes a gain of 11½ points to offset it. Her gains of 7½ and 5½ points in the information and thought phases of geography likewise balance one another to make a normal amount of gain in the subject. In arithmetic problems alone does she fail to make any gain. The apparent loss of one point is probably an error of measurement.

A comparison of Margaret's achievement quotients for each

PLATE 15

Name L ...., Margaret **Sex** F 5 BA 6 BA 7 BA 8 BA 9 BA **Grade** **Born** April 28, 1912 Mo. Day Yr. **Age** 12 — 0 Yr. Mo. **on** May 25 1924 Date

Parent or Guardian **Address** **Telephone** **Occupation**

		Intelligence					Intelligence					1. Spelling					2. Reading, Th.-McC					3. Reading					4. History Information					5. History Thought				
Born Where? .... Nationality of Father .... Mother .... Years in school before entering grade 6, k'g'n not included.		Test	Score	Men. Age	Grade Var in months	Men. Q.	Test	Score	Men. Age	Grade Var in months	Men. Q.	Scale	Score	M.A. Var. x 1⅓*	Grade Var x 1⅓*	Ach. Q	Scale	Score	M A. Var. x 1⅓*	Grade Var x 1⅓*	Ach. Q.	Scale	Score	M A. Var.	Grade Var	Ach Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.
Grade	Test	7A										43															S2					R2				
6A	Score		89										55½															62½					76½			
Date May 1924	M.A. Var.			13-10										-3															-19½					-5½		
Age	Grade Var				+16										+5															-11½					+2½	
12 — 0	Quotient					115										96															76					92
Grade	Test	7B										B3					4										R2					R2				
7A	Score		113										60					56										64½					88			
Date May 1925	M.A. Var.			14-11										-2					-6½										-24					-½		
Age	Grade Var.				+17										+6					+2										-15½					+8	
13 — 0	Quotient					114										97					93										73					100
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

		6. Geography Information					7. Geography Thought					8 Arithmetic Add.Subt.Mult.Div.					9. Arithmetic Add.Subt.Mult.Div.					10. Arithmetic Problems					11. Vocabulary					12. Handwriting				
		Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	Grade Var.	Rate	Grade Var.
Grade	Test	S2					R2															I3														
	Score		72					70															62													
Date	M.A. Var.			-10					-12															-12												
Age	Grade Var.				-2					-4															-4											
—	Quotient					88					85															85										
Grade	Test	R2					R2					R3										II3														
	Score		79½					75½					96										61													
Date	M A. Var.			-9					-13					+7½										-19½												
Age	Grade Var.				-½					-4½					+16										-11											
—	Quotient					90					85					109										78										
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

subject at the close of the sixth and seventh grades reveals no significant improvement. The gain in quality of work in the thought phase of history is offset by its deterioration in arithmetic problems.

In the middle row of little squares in the second row of large squares all but one of the mental age variations have minus signs in front of them. Evidently she is not working up to her mental-age norms except in the fundamental operations of arithmetic. In the information phase of American history she is four years below her mental-age norm, in arithmetic problems she is three years below. Some of her scores are even below the seventh-grade norms. In the thought phase of geography, in arithmetic problems and in range of information in American history she is from three-fourths of a grade to two and a half grades below the seventh-grade norms. And this is true in spite of the fact that she has a mental age of 14 years 11 months, which is nearly a year and a half above the seventh-grade norm of 13 years 6 months. An extra half-year promotion is hardly in order for Margaret.

The four individual records that have just been discussed are not extreme cases. On the contrary, they are typical cases of which duplicates may be found in nearly every class. And they are all cases that require quantitative observation and the personal attention of the principal. Something in the way of more exact information, such as these records furnish, may at first use seem somewhat disconcerting. It tends to make the cases stand out so much more forcibly. Yet a reasonable analysis and interpretation of individual cases can be arrived at only on the basis of just such information, supplemented by the observations of the teachers. In dealing with these pupils intelligently there will need to be brought into play all of the principal's experience, common sense, good judgment, and scientific training.

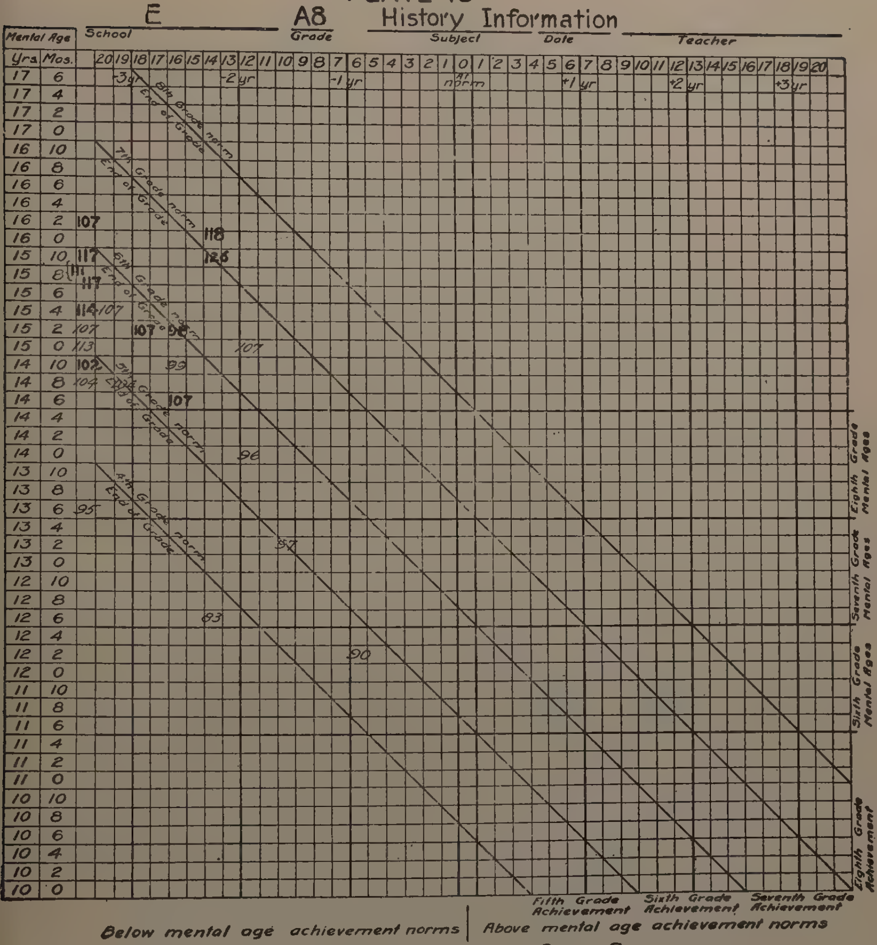
CHAPTER IV

DISCOVERING HOW WIDELY DIFFERENT RESULTS MAY BE ACHIEVED IN THE SAME SUBJECT

Variations in the distribution of emphasis from one phase of instruction to another in the same class are common. The relative amounts of emphasis given to any phase of instruction likewise vary from class to class. Were there no migration of pupils from one school to another this feature might be of small importance. But people not only move from one community to another, they frequently move from one school district to another within the same city. Pupils transferring from a school where achievement in the thought phase of the work has been overemphasized at the expense of the other phases of instruction find themselves at a serious disadvantage on entering a school in which spelling, the fundamental operations of arithmetic and the information phases of history and geography have been unduly stressed. Such differences in relative standards of attainment frequently make the migrating child a misfit pupil educationally. It may even seem necessary for him to drop back a grade in his classification or else to repeat the grade in case he is assigned to the same grade in the new school as in the one from which he came. Peculiar features of classification or variations in the distribution of the teacher's attention among the pupils from one class to another in the same grade may still further add to the educational misadjustments of pupils. The nature of these tendencies will be apparent from an analysis of a few class records. Each of the plates represents the achievement and quality of work of an eighth-grade class of the same school system in the information phase of American history.

A Class Peculiar in Composition and Very Poor in Quality of Work. As the class mental age of the eighth-grade class in school E (Plate 16) is at least 15 years 0 months, it should be expected to show an achievement level half a grade higher than

PLATE 16



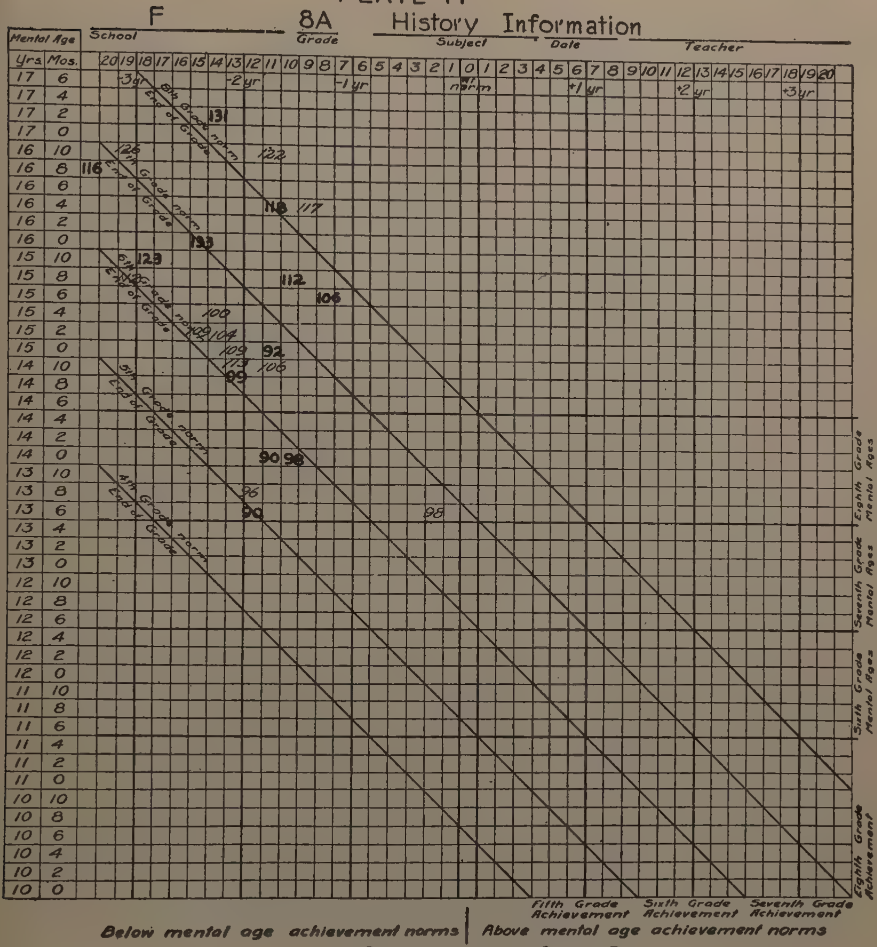
CLASS RECORD CARD - B

The numbers in italics indicate intelligence quotients of girls; those in heavy type indicate intelligence quotients of boys.

the eighth-grade norm. But there are only two pupils who attain the seventh-grade standard and only three more who reach even the sixth-grade oblique norm line. In quality of work more than half of the class are at least three years below an average quality of work; that is, at least three years below the normal scores for their mental ages, and only two pupils are not at least two years below an average quality. In mental age they range from sixth-grade pupils to high school sophomores. But more striking than the range of mental ages is the sex difference. Of the ten pupils with mental ages below 15 years 0 months only two are boys. Of the eleven pupils above 15 years 0 months in mental age only two are girls. Where are the other girls with the higher mental ages? As only girls with very low mental ages are in the class now those with the higher mental ages have evidently already been graduated from the eighth grade. This may have been highly advisable as there would be very little stimulation for them to work with seventh-grade girls. But why were not the mentally older boys also sent along earlier with the girls? Certainly not because of low rates of achievement for the intelligence quotients of all the boys but one in the top half of the class are above 110. If these boys have been held back because they have achieved less than the girls, of which there is no evidence or even a suggestion of any, why were they not stimulated to do just as good a quality of work and to make just as high an achievement record?

Similarity in Quality of Work Among the Pupils of a Class is Attainable. The striking feature about Plate 17 is the closeness of the clustering of the numbers around the "—2 yr." vertical line. Only three cases lie outside the "—1 yr." and "—3 yr." vertical lines. Although only one of the pupils is doing a good quality of work they are nearly all working at a highly uniform quality. The probable error of the placements, which is three points, would account for most of the scattering to the right and left of the "—2 yr." line. That few of the pupils are working below the class quality is assuredly desirable. That few are working above it may be equally desirable even though excellence in quality of work may be a very desirable trait. Among the pupils of this class nothing else has evidently been neglected for the attainment of information in American history. The gifted pupils in the top half of the class are evidently doing just about as good a quality of work as the less gifted pupils in the bottom part. This is certainly a highly desirable condition even if the failure of the class as a whole to come up to an average quality of work is an equally undesirable condition. This, however, is not the fault of the teacher. The pupils entered the

PLATE 17

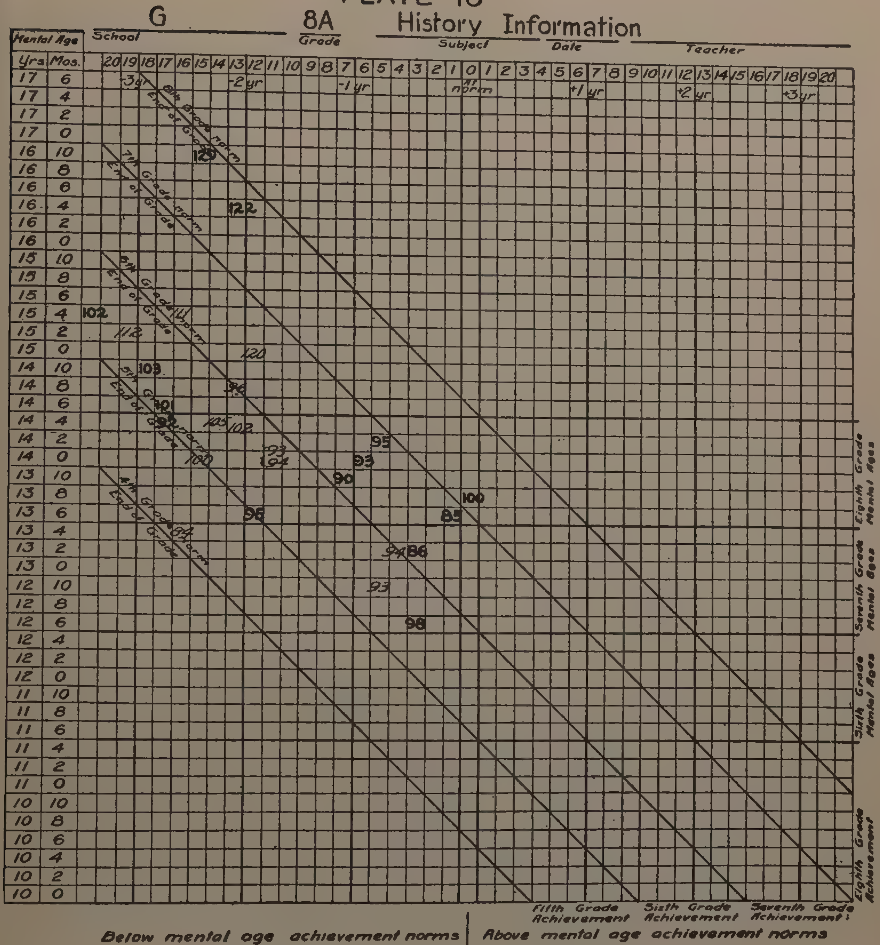


CLASS RECORD CARD - B

eighth-grade class with very narrow ranges of information in American history. This fact, of course, needs to be given serious consideration as only three of these eighth-grade pupils have an eighth-grade range of information. Only four more have a seventh-grade range of information although in mental age they are at least beginning high school sophomore students. Nevertheless the students in this class are far better equipped for high school entrance than those in school E. Only four instead of all but three have failed to attain a sixth-grade range of information and no one of these four has a normal eighth-grade mental age for the end of the year. Nor have the wider ranges of information been achieved to the neglect of the ability to do problems involving historical data. In the thought phase the eighth-grade class in school F is doing a normal quality of work, in school E they are fully a year below an average quality of work and the scattering of the cases is considerably greater than in school E.

The Teacher's Attention May Be Very Unevenly Distributed Among the Pupils of a Class. The eighth-grade class in school G is a striking example. In mental ages the pupils range from 12 years 6 months to 16 years 10 months, yet with but three exceptions the scores in the American History Information Scale R, Division 2, fall either on or between the fifth-grade and seventh-grade oblique grade norm lines on Plate 18. Although the two gifted pupils in the class have beginning high school junior mental ages they have narrower ranges of information in American history than should be expected of average eighth-grade pupils. Two of the pupils with only normal beginning eighth-grade mental ages also have normal ranges of information for beginning eighth-grade pupils. They are doing an average quality of work instead of a quality two or more years below the average. But this same tendency seems characteristic of the class. There seems to be but a slight relation between the achievements of the pupils and their mental ages. Perhaps the teacher did not realize the wide range in the mental ages of the pupils and tried to bring all the pupils up to the same grade level. The less gifted pupils she nearly succeeded in stimulating to work to their capacity. But in the process of urging on the less gifted pupils, the pupils with the higher mental ages evidently failed to surpass the level of attainment set by the less gifted. In fact, with the exception of the two gifted pupils, whose numbers appear toward the top of the plate, the pupils with the higher mental ages fail to reach as high a grade level as the less gifted. A very different explanation may better fit the facts. As the same tendency is apparent in the thought phase of American history and also in the other phases of school work in this class, it is more likely that the teacher centered her attention and help upon the less gifted pupils

PLATE 18

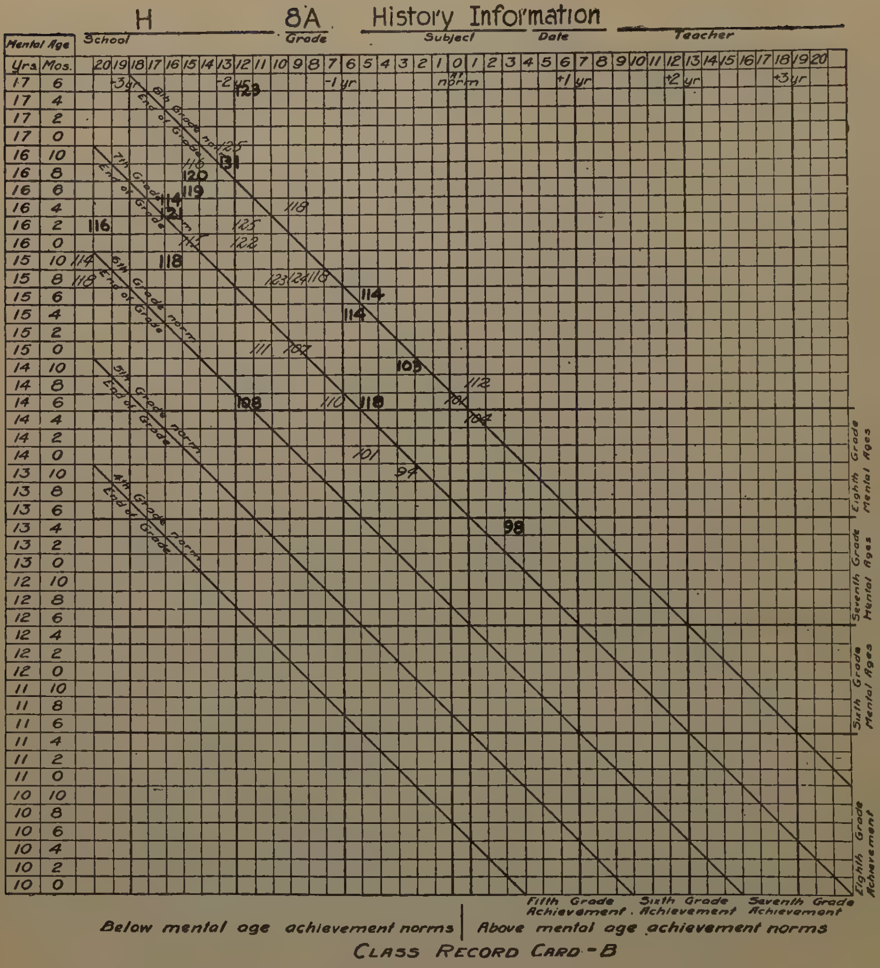


CLASS RECORD CARD - B

and left the rest to shift for themselves. Among the pupils with intelligence quotients above 100 there is no marked difference in quality of work. For all of them it is poor.

Even More Striking Is the Attention to Grade Norms in School H. While the intelligence quotients of more than half of the eighth-grade class in school H cluster around the oblique eighth-grade norm line on Plate 19, only one number is signifi-

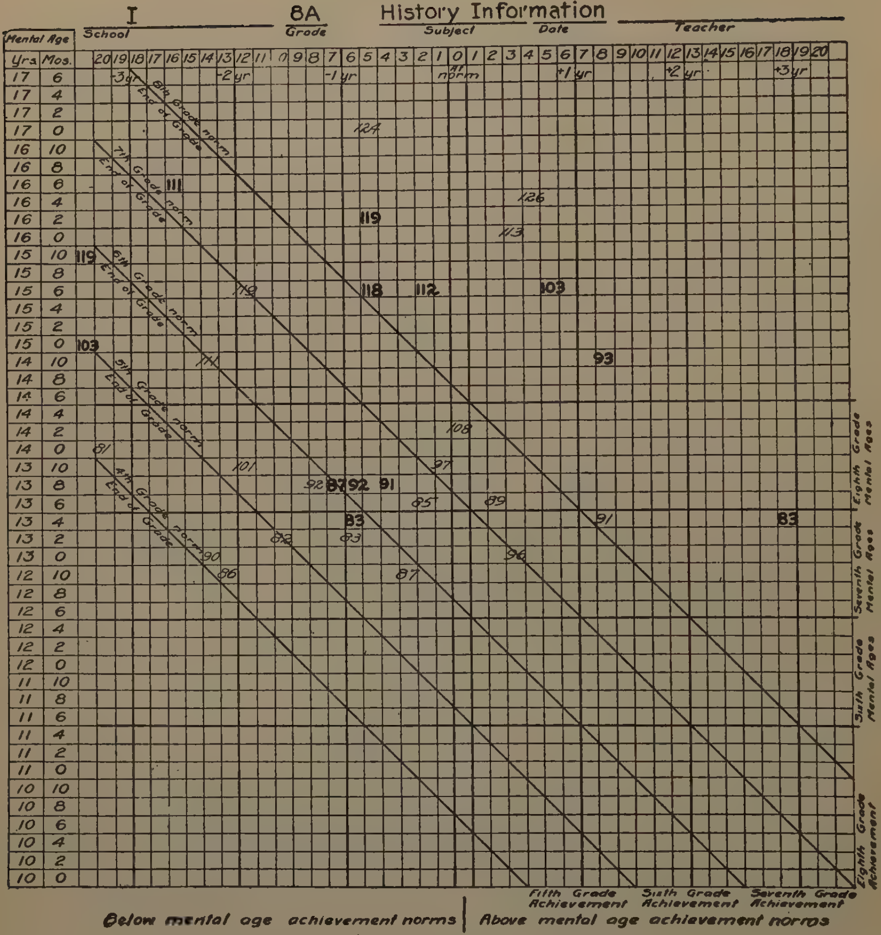
PLATE 19



cantly above it. Of the rest of the class the intelligence quotients of all but four cluster around the oblique seventh-grade norm line. To have brought nearly the whole class up to normal attainment for the grade might be considered very commendable teaching had the American history tests alone been given. In the thought phase of American history exactly the same tendency is apparent and quite as pronounced except that the whole level of attainment is fully a year higher. The mid scores of this class in other subjects as well as in history and the narrow ranges of their variability or narrow scatter around the class scores would fully justify the highest praise for the work of this school were it not for the mental test scores. Less than a third of the class have eighth-grade mental ages or below. Nearly two-thirds of the class have mental ages at least a year in advance of the normal mental age. The quality of work of this mentally older section of the class is again fully two years below the average in quality. Instead of commending the school for its excellent achievement the mental test scores incline one to ask why these gifted pupils have been kept meandering along in the elementary school. Perhaps it was because the principal and teachers consider that they need greater abilities in the elementary school subjects than do children of average intelligence. This may be very true, but these gifted pupils have no greater abilities than the average pupils in the same class. They have only a markedly inferior quality of work. One wonders whether in their apparent neglect they have just been idly wasting time or whether they have been building up ineffective methods of study and inefficient habits of work. Whatever may be the consequences of the instructional conditions found in this class, there seems to be no more excuse for them than for considering the measurements of the pupils' achievements without taking into account their mental ages also.

Wide Variability in Quality of Work Is Not Uncommon. Even such a wide distribution of numbers as that from the left to the right side of Plate 20 is very frequently found. This is in sharp contrast to the narrow variability in quality of work found in Plate 17. The wide spread in achievement—from the oblique fourth-grade norm line to two years beyond the oblique eighth-grade norm line, is also in marked contrast to the extremely narrow range of achievement in Plate 19. Nor is the range of mental ages any wider. The class score barely reaches the seventh-grade norm in contrast with nearly an eighth-grade class score for school H. To compare the two classes on the basis of the class scores alone would be wholly misleading, for the class mental age of the eighth grade in school I is more than two years lower than that of the eighth grade in school H. Nor can a wide

PLATE 20

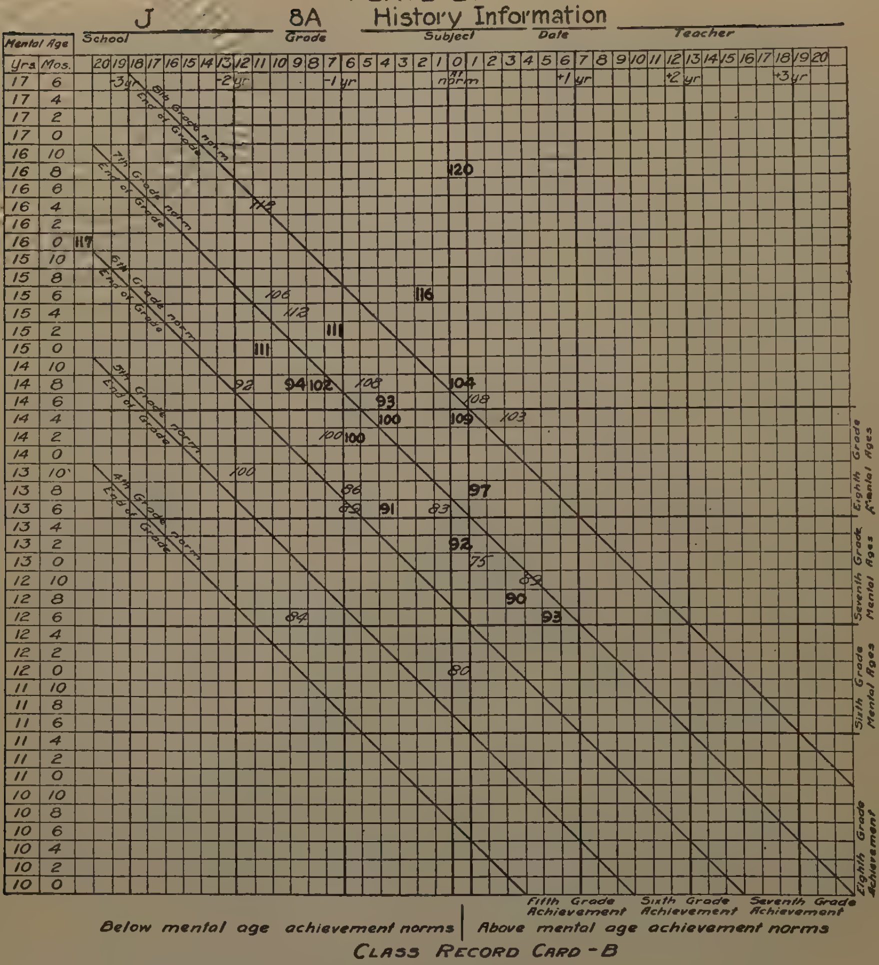


CLASS RECORD CARD - B

variability in scores, even when there is a wide variability in mental ages, always be accepted as a favorable feature any more than a narrow range of scores can be considered desirable in itself. In school I the wide variability in achievement is partly a reflection of the wide variability in quality of work. Some of the mentally older pupils are doing the poorest quality of work while some of the mentally less mature are doing the better quality of work. The reverse is also quite as true. In spite of the wide range neither the best nor poorest quality of work is confined to any particular group of pupils. Instead of attempting to have the pupils maintain a relatively uniform level of achievement in all phases of their school work they have been encouraged to concentrate their effort on those phases in which they had achieved the most. Despite the almost uniform distribution of emphasis among the various phases of school work in school I, the individual record cards of the pupils show striking variations in achievement from one phase of instruction to another. For the boy on Plate 20 with a mental age of 15 years 10 months and an intelligence quotient of 119 to enter the same high school class in American history with the girl having a mental age of 16 years 4 months and an intelligence quotient of 126, from whose achievement record in American history he differs by nearly four years, may be a more serious handicap than to enter the class with the gifted pupils of school H, even with those having eighth-grade ranges of information.

Boys Are Frequently Held to a Higher Standard of Achievement than Are Girls. When achievement scales for measuring ranges of information in any subject are first devised wide sex differences are invariably discovered. The median scores for girls are usually found to be fully a year below those of boys in the same classes. Among the elementary school subjects this was found true for both American history and geography. In the high school subjects of general science, chemistry and physics striking sex differences have also been discovered. The data for the eighth-grade class in school J (Plate 21) illustrates this tendency. In quality of work the mid-score of the boys is half a year higher than that of the girls. Of the 17 pupils whose numbers are located at the right of the vertical line between the 4 and 5 on the left side of the "At norm" column on Plate 21 only 6 are girls. Of the 16 pupils whose quality of work falls at the left of this line only 6 are boys. Among the few pupils with the higher mental ages and among the less gifted pupils the difference is still more marked. The class as a whole is only half a year below an average quality of work despite the fact that American history was not studied in the seventh grade. This is somewhat better than in class I and very much better than in the classes earlier described. The variation in quality of

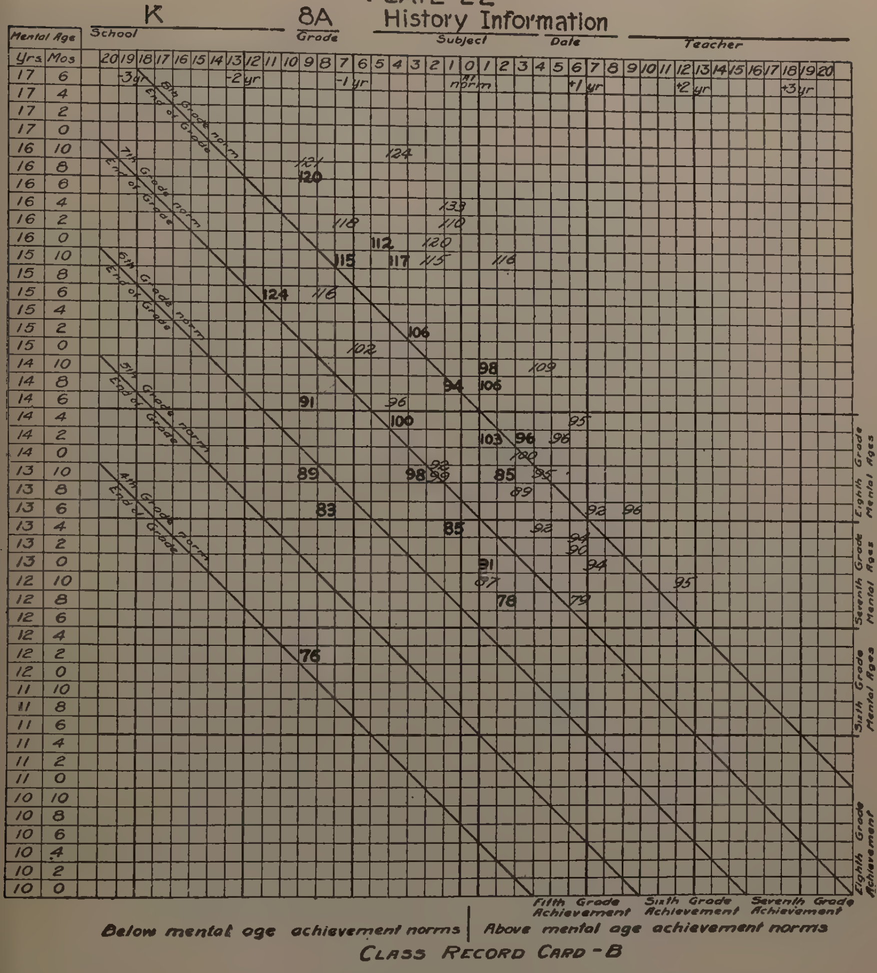
PLATE 21



The numbers in italics indicate intelligence quotients of girls; those in heavy type indicate intelligence quotients of boys.

work is very much smaller than in school I. There is, however, a tendency for the mentally older pupils to be held to a less rigid standard of attainment than the less gifted pupils. In intelligence quotients this class is in marked contrast with class H. Only two pupils in class H have a normal rate of achievement of less

PLATE 22



CLASS RECORD CARD - B

than 100. In class J fifteen have intelligence quotients of less than 100.

Girls Can Attain Just as Wide Ranges of Information as Boys. Of the 25 pupils of the eighth-grade class in school K who attain or surpass the eighth-grade achievement norm, 16, or nearly two-thirds, are girls. Nor is this due to the fact that they are mentally older than the boys. In each group of pupils,

—the superior, the average, or the less gifted,—the intelligence quotients of the girls are found in the largest numbers toward the right of the plate. That girls have less interest in history or less capacity to acquire information in it seems seriously open to question in the light of these data. The better quality of work is characteristic of the less gifted pupils in school K, just as it is in schools G and H (Plates 18 and 19) but it is nowhere nearly as marked. In mental age the class is nearly a normal one but the pupils are widely scattered about the norm. They have been in all these eighth-grade classes. This tendency is more characteristic of the upper than of the lower grades, however, where occasionally a range of only two years is found. The range in achievement is fairly wide, as it must be when the range of mental ages is wide and the range in quality of work is reasonably narrow. Not only do the data on this plate make it clear that girls can do as well as boys but they also indicate that the eighth-grade norms in American history are within the reasonable attainment of average eighth-grade pupils. Furthermore, their attainment in the range of information in American history was not secured at the expense of the thought phase nor to the neglect of any other phase of school work.

That eighth-grade classes in the same school system could differ so widely in achievement as Plate 16 through 22 indicate seems almost incredible. Nor are their differences in composition and class mental age any less striking. That they should differ so widely in quality of work, in its variability and in its distribution among the mentally older and younger as well as among the girls and boys, is truly astonishing. It is also obvious that the discovery of the actual instructional conditions in a class is the first essential for more adequate supervision.

CHAPTER V

EVALUATING THE WORK OF A SMALL CITY SCHOOL SYSTEM

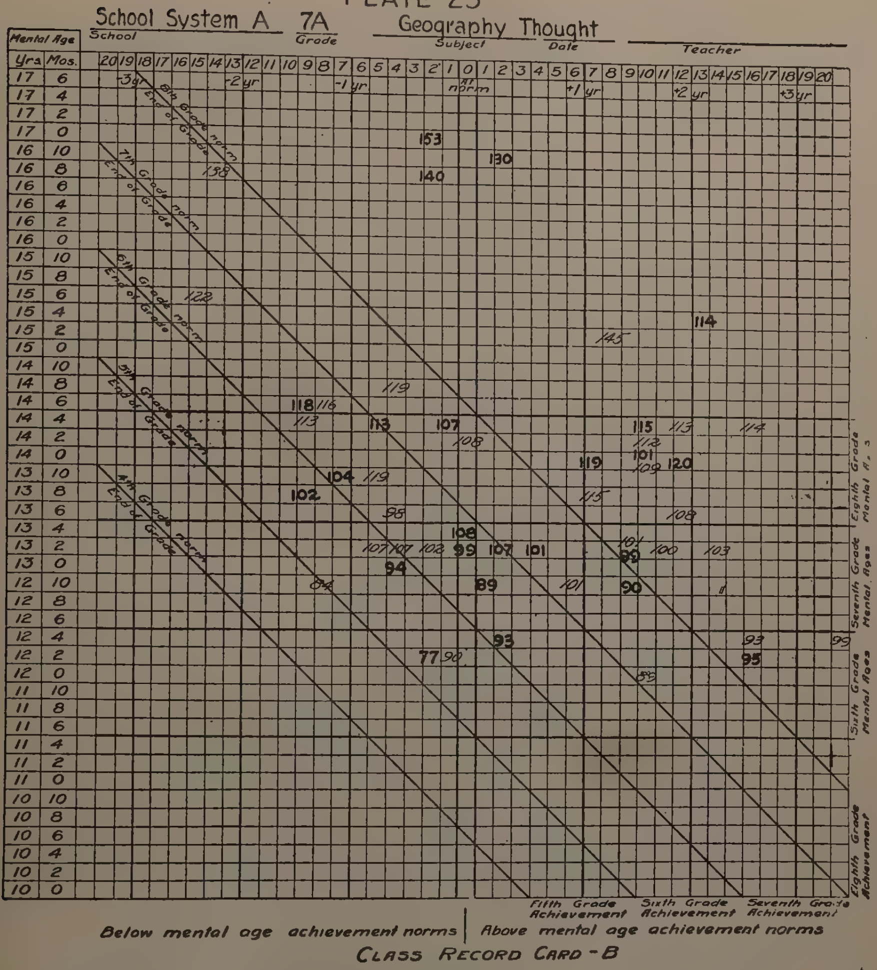
The school superintendent in a small city is not only the manager of the community's most important business concern but is also, at the same time, the director of one of its most important social institutions. As a business manager he is expected to organize and maintain the school system at a high level of efficiency with a minimum expenditure of funds. To this end the recent studies in school administration have made valuable contributions. Definite standards for school buildings and their equipment have been worked out. Likewise, the size of classes, the professional training of the teachers and the salary schedule are comparable from school system to school system.

As the director of a social institution, the superintendent has wider relations than as its business manager for the community. In this capacity he is not only responsible to his community but also to the entire social group. In our age of wide communication, rapid social and industrial changes and frequent migration, children can no longer be educated to become the citizens of their local community. A common though diversified background of experiences, skills, abilities, and ranges of information seems more essential than ever. If a certain amount of information in American history and geography is essential for the children of one community it is equally essential for similar children in other communities. This feature has been widely recognized in the scientific studies in education and also in the setting up and aiming at grade standards of achievement. That the grade norms for the Courtis Standard Research Tests in Arithmetic have had a wide influence during the past decade in developing and maintaining standards of speed and accuracy in the fundamental operations is beyond a doubt. Such norms of attainment are quite as much needed in other phases of instruction as in arithmetic; and like the norms in the Courtis tests they need to be concrete and capable of examination and criticism. In view of the fact that the level of intelligence among children varies from community to community, grade standards alone are inadequate. Mental-age standards are not only desirable but essential for the adequate evaluation of the achievement of any school system. To obtain a comprehensive idea of the achievement of his school system as compared with that of others the superintendent needs to knows the quality of work of the students as well as their achievement, the relative amounts of emphasis given to the different phases of instruction, and also the peculiarities in the distribution of the attention of the teachers among the different groups of pupils.

In Achievement in Any Subject Two School Systems May Differ Widely. How widely they may differ in two neighboring cities of about the same size is apparent in the next four plates. The same series of mental and achievement tests were given in the two cities and the pupils' variations from their mental-age norms plotted on the class record cards in the usual way. In achievement in the thought phase of geography the seventh-grade pupils of school system A (Plate 23) are surpassing the seventh-grade norm by half a year. In actual attainment they scatter rather widely. Although very few are below the sixth-grade norm at least two out of each five have reached the eighth-grade achievement norm and a number have surpassed it by a year. In mental age the class is about a quarter of a year beyond the normal mental age for seventh-grade pupils at the end of the year, but this slight advantage would not account for the superior achievement of the class.

Comparatively few of the pupils are above the normal mental age for the eighth grade and these are mostly gifted pupils who have done an average quality of work or better. The two girls with intelligence quotients of 138 and 122 are the only exceptions. While the quality of work for the class is but slightly above the average, the spread of the cases to the right of the "At norm" column is considerably greater than their spread to the left of it. In quality of work the boys and girls are doing

PLATE 23

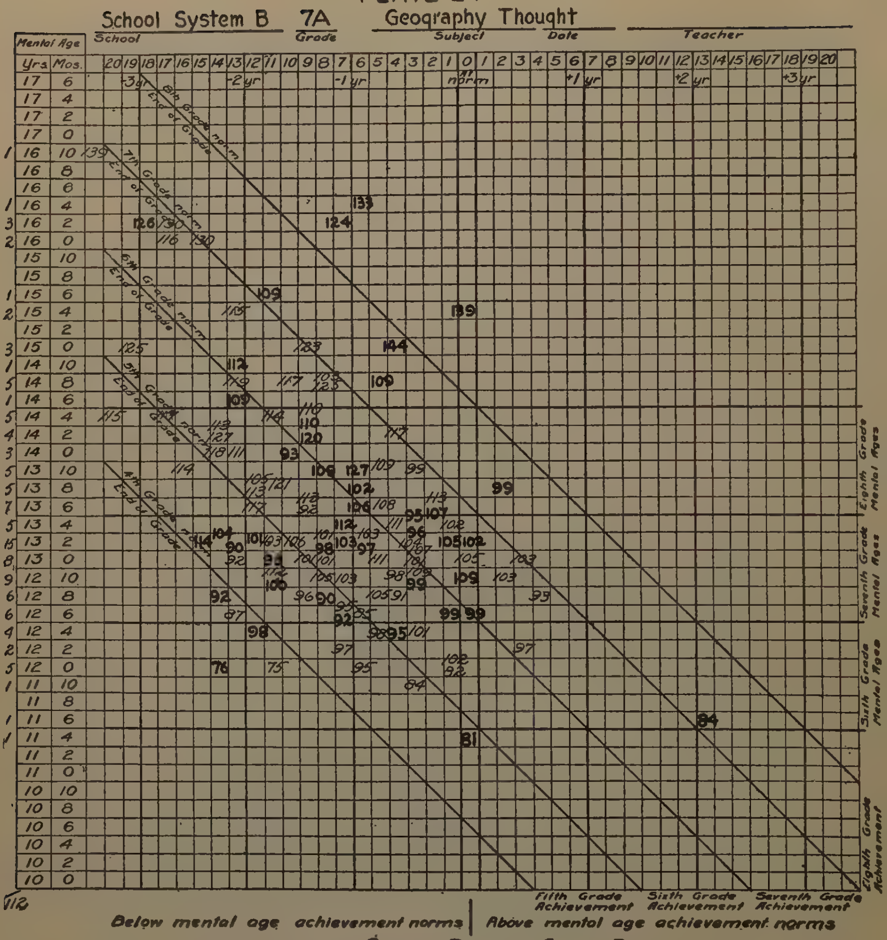


The numbers in italics indicate intelligence quotients of girls; those in heavy type indicate intelligence quotients of boys.

about equally well; the mentally older and the less gifted pupils are also doing a similar quality of work.

The record for school system B on Plate 24 is a very different one. The number of pupils is more than twice as great. This is due to the fact that in school system B there are only yearly promotions while in school system A they occur each half year.

PLATE 24



CLASS RECORD CARD - B

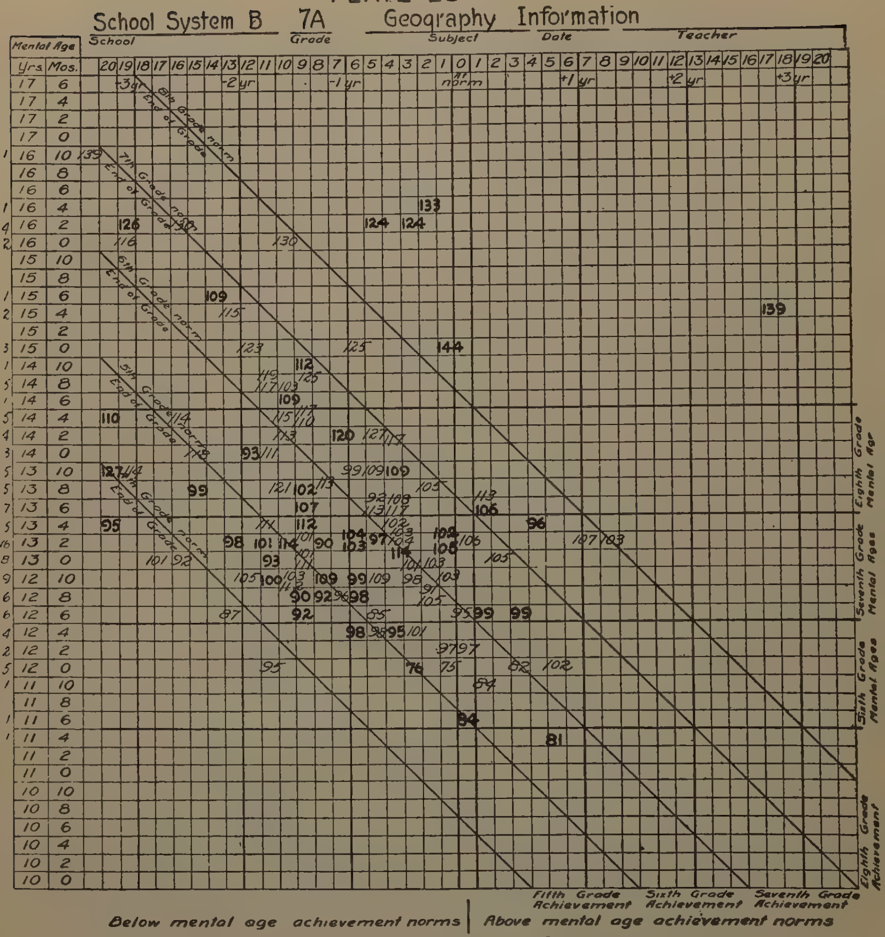
In school system B the median mental age of the seventh grade pupils is about a quarter of a year below the normal mental age of seventh-grade pupils. Thus there is a difference of a half year in the mental ages of the seventh-grade pupils in the two systems. With their younger mental ages the pupils in school system B might well be expected to stand half a year lower in achievement than the pupils in school system A. But they are nearly two years lower in actual achievement. Only fifteen per cent reach the seventh-grade norm while only three surpass the eighth-grade norm despite the fact that nearly double the number of pupils in school system B have eighth-grade mental ages. In quality of work very few surpass the average. Only six cases lie to the right of the "At norm" column. More than half of the pupils are working a year below an average quality of work. Moreover, the pupils with mental ages above the seventh-grade norm line, which falls at 13 years 6 months, are doing a somewhat poorer quality of work than the mentally younger pupils.

Perhaps the thought side of geography has been neglected at the expense of the information phase in school system B. The appearance of Plate 25 fails to confirm such a suggestion, however. The information phase seems to have been underemphasized in school system B to almost the same extent as the thought phase. In quality of work only a few are above the average, just as in the thought phase. About half of the class are a year below it. Again the mentally older pupils are doing the poorer quality of work. In actual achievement the class is doing only sixth-grade work although in mental age it lacks only a quarter of a year of the normal seventh-grade mental age.

In school system A, however (Plate 26), at least three out of each five pupils have surpassed the eighth-grade achievement norm in the information phase of geography. Only three pupils are below the sixth-grade norm or below the mid score of the seventh grade of school system B. Taking the difference in mental ages into account the seventh grade of school system A is fully a year and a half in advance of school system B in both phases of geography at the end of the seventh grade. In both systems the study of geography has been completed. Is it possible that the pupils of school system A will need wider ranges of information and greater abilities than similar pupils in school system B? The disadvantages that pupils will be under in transferring from either of these two systems to the other are only too apparent.

In Both School Systems the Gifted Pupils Are Unreasonably Retarded. In school system A there are four gifted pupils whose capacity for school achievement seems not to have been discovered. Yet they are more than a year older mentally than

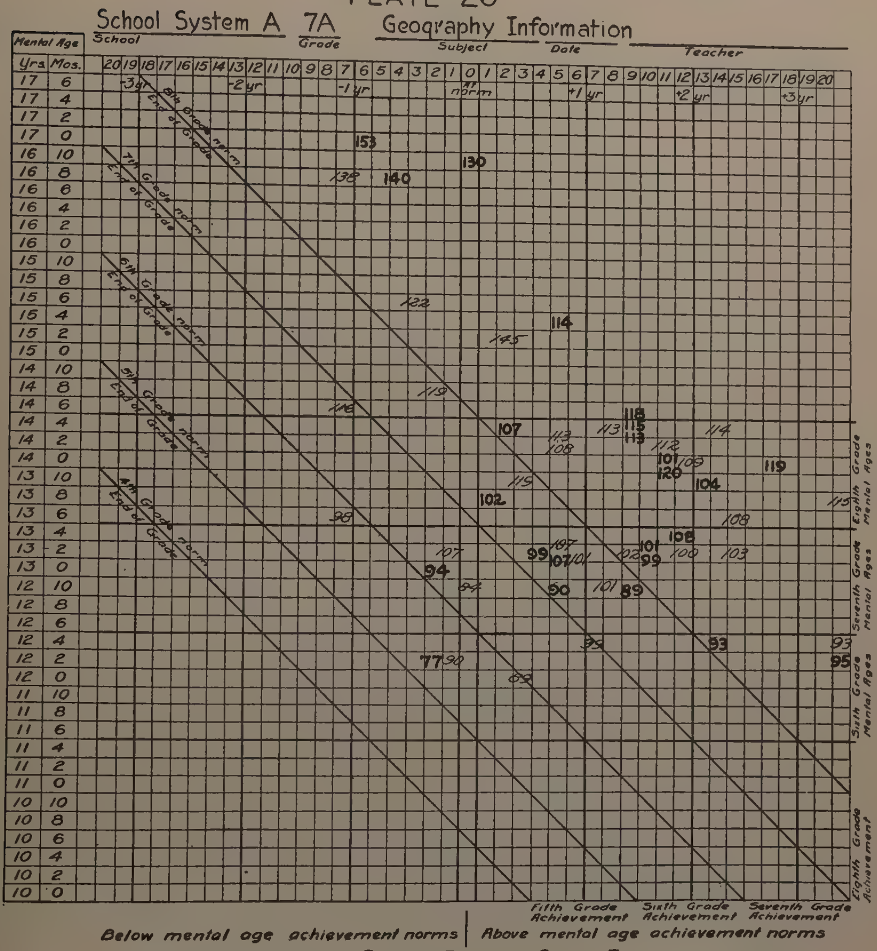
PLATE 25



CLASS RECORD CARD - B

the next three pupils. In nearly every phase of school work these pupils are above the eighth-grade norms. Despite their retardation they are doing nearly an average quality of work in most instances. Rather than take the risk that they might suffer a deterioration in quality of work if retained in the elementary school for another year, they were promoted directly to the high school. Almost without exception the marks in their high school studies have been above the medians for their

PLATE 26



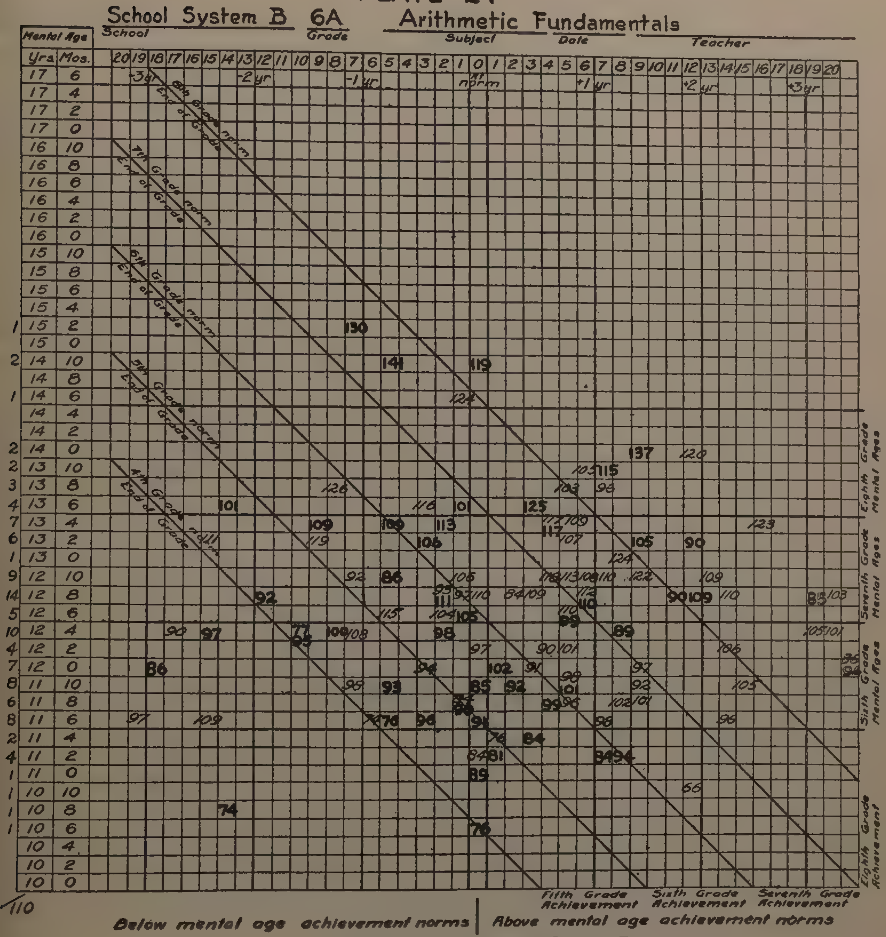
CLASS RECORD CARD - B

respective classes. Why any of the seven pupils with mental ages above 15 should still be in the seventh grade is explainable only on the basis of their young chronological ages. In school system B there are also a few gifted children and a number with mental ages somewhat above the eighth-grade norm. Again, chronological immaturity seems to be mainly responsible for their retention in the seventh grade. On the whole the pupils with intelligence quotients around 125 and above are also half a grade farther along than similar pupils in school system A. In most instances they are above the eighth-grade achievement norms and are doing nearly an average quality of work. They too might well be promoted to the high school. Their further retention in the elementary school along with pupils of sixth-grade mental ages and fifth-grade and sixth-grade achievement attainments can hardly be a proper stimulus for them to improve in the quality of their work.

A School System May Show Wide Variations in the Amount of Emphasis Given to Different Subjects. In the sixth grade of school system B (Plate 27) the fundamental operations of arithmetic receive a normal amount of emphasis. The median quality of work of the grade is even slightly above the average. More than half the class are doing sixth-grade work or better. About one out of each five is doing eighth-grade work or better. Only about the same proportion fall below the fifth-grade norm. The mental ages are fairly well confined within the limits of the fifth-grade and seventh-grade normal mental ages, yet the achievement of the grade ranges from that of fourth-grade pupils to that of eighth-grade pupils. This is accompanied by a wide range in quality of work. Although there is a wide variability in the quality of work within the grade this is not due to the centering of the teachers' attention upon any particular group. The girls and boys do about equally well and so do the mentally older and the less gifted.

In spelling, however, a very different condition is evident from Plate 28. The range of achievement is much narrower, stretching only from the fourth grade through the seventh except for a few sporadic cases. Six pupils only surpass the seventh-grade norm. Only a small proportion of the pupils are doing better than an average quality of work and all but two of these are girls. There also seems to be a distinct tendency for both the gifted and less gifted pupils to do less well than the pupils of about average intelligence. Very seldom is spelling lacking in sufficient emphasis as compared with the other phases of instruction. In school system B somewhat more attention needs to be given to the work in spelling, especially in the case of the mentally older pupils who will be most in need of it.

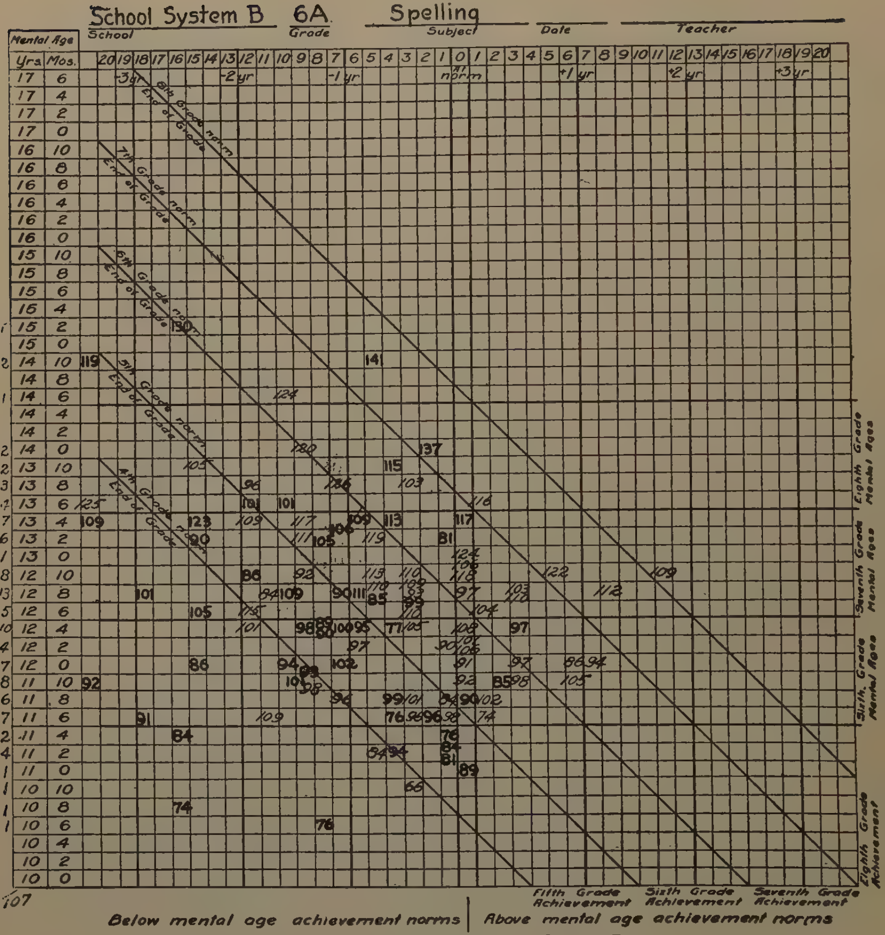
PLATE 27



CLASS RECORD CARD - B

Spelling, however, was not neglected for the acquisition of facts in American history, as may readily be seen from Plate 29. Only two pupils are doing better than an average quality of work. More than a third of the grade are more than three years below an average quality of work. Although the range in quality of work seems fairly narrow, this is due to the fact that the intelligence quotients of all the pupils with mental-age variations of —21 or lower are entered in the last column to the left

PLATE 28

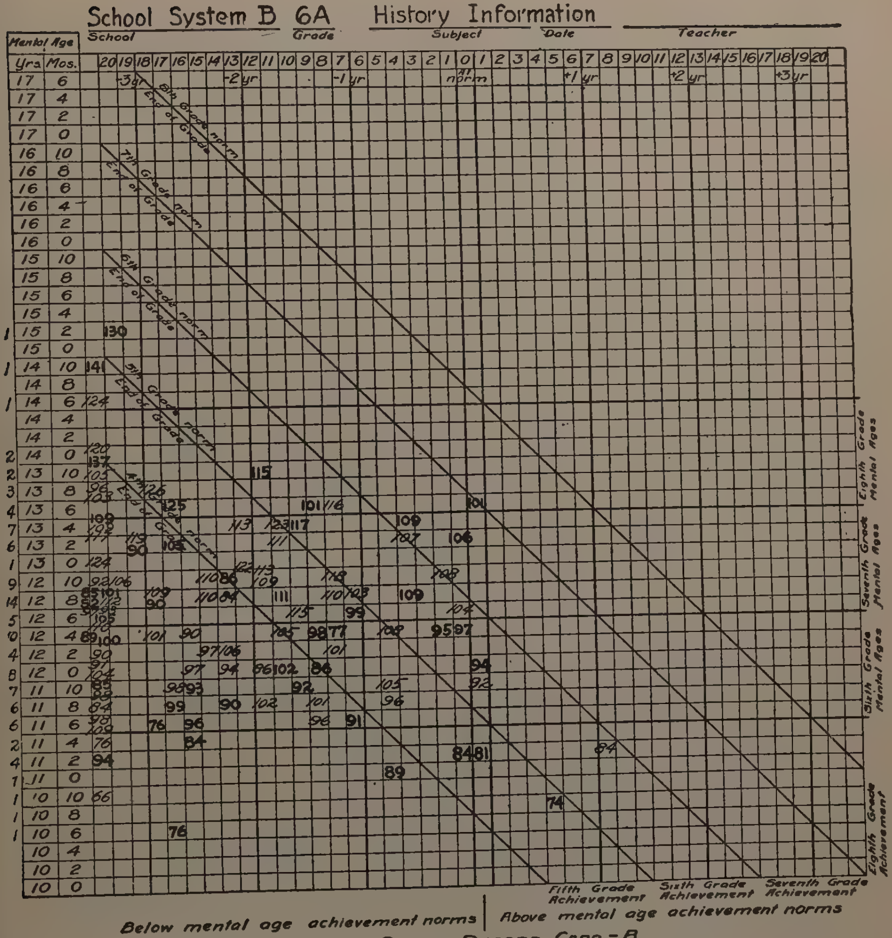


CLASS RECORD CARD - B

instead of being spread out. Only seven pupils have attained the sixth-grade norm (the middle oblique line) in the information phase of American history, while more than half the class have narrower than normal fourth-grade ranges of information.

Marked Changes in Emphasis May Occur from One Grade to the Next in the Same School System. In school system B just such a change of emphasis occurred in the teaching of

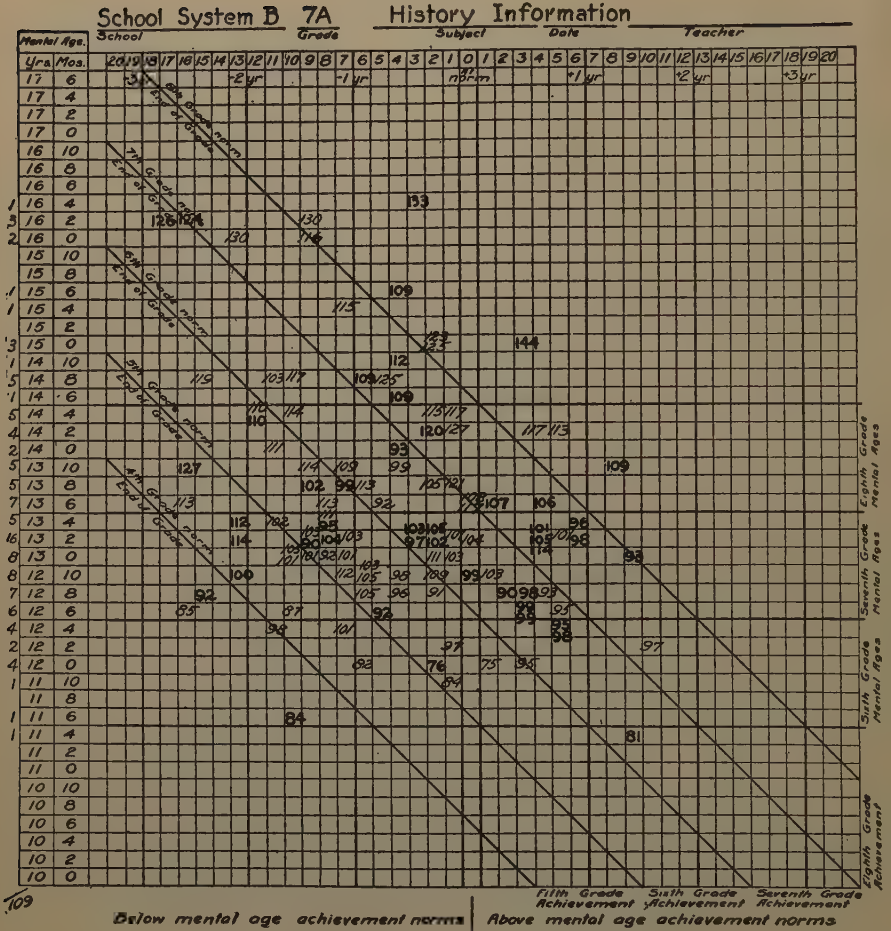
PLATE 29



CLASS RECORD CARD - B

American history. In contrast to the very poor quality of work and very low achievement in the sixth grade the record of the seventh grade on Plate 30 is a distinct surprise. In quality of work the class is only about half a year below the average. Nearly a third of the grade has attained the seventh-grade achievement norm. The intelligence quotients of only a small proportion of the pupils are below the oblique fifth-grade achievement norm line. Only a small proportion of these pupils below

PLATE 30



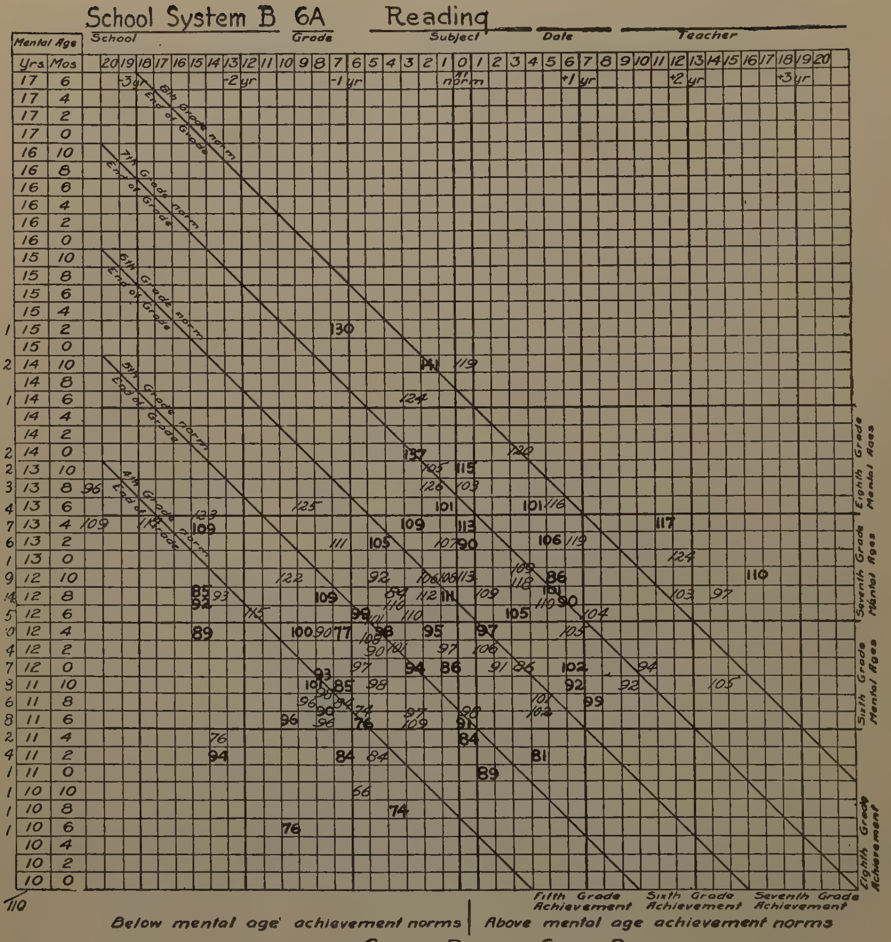
CLASS RECORD CARD - B

the fifth-grade norm in achievement are below it in mental age. Not only has the relative emphasis placed upon the information phase of American history markedly changed from the sixth grade to the seventh but there has been a change in the distribution of the teachers' attention. In the sixth grade the capacities of the few pupils with the highest mental ages were not recognized but in the seventh grade they are doing markedly better even though there is a distinct tendency for the best quality of work to be done by the less gifted pupils. Despite this tendency, however, the variability in quality of work is less in the seventh grade than in the sixth grade.

In the Higher Grades the Superintendent Needs to Watch for Greater Variability in Both Mental Ages and Achievement. This tendency is certainly apparent in school system B. In the sixth grade (Plate 31) the mental ages are concentrated between the fifth-grade and seventh-grade mental-age norm lines. The reading abilities of the pupils spread out over a little more than the four grades between the fourth-grade and eighth-grade oblique achievement norm lines. In quality of work the intelligence quotients are within a year and a half to the left of the "At norm" column and a year to the right of it. The distribution of the intelligence quotients in reading is similar to what they are in spelling (Plate 28) except that they are about a year farther toward the right. The best quality of work in reading, as in spelling, is done by the pupils of average intelligence.

The distribution of mental ages in the eighth grade (Plate 32) extends from 11 years 4 months to 17 years 4 months, a range of six years as compared with four and a half years in the sixth grade. In going through the grades the less gifted children are frequently retained in a grade but seldom as often as their mental ages would suggest. As a consequence the upper grades collect more and more pupils with high chronological ages and low mental ages in comparison with the grade norm. The pupils in the sixth grade with intelligence quotients around 83 are gaining in mental age only about eight-tenths as rapidly as the pupils with intelligence quotients around 100. During the two years from the end of the sixth grade to the end of the eighth grade they gain only about a year and seven months. Only a part of these will suffer detention and some with even lower intelligence quotients do not repeat from the sixth to the eighth grade. Hence the downward spread in mental ages in the higher grades. A similar tendency is at work to stretch the grade out at the upper end. Even though the gifted and near gifted pupils are frequently granted an extra promotion, these extra promotions seldom keep up with the pupils' rapid increases in

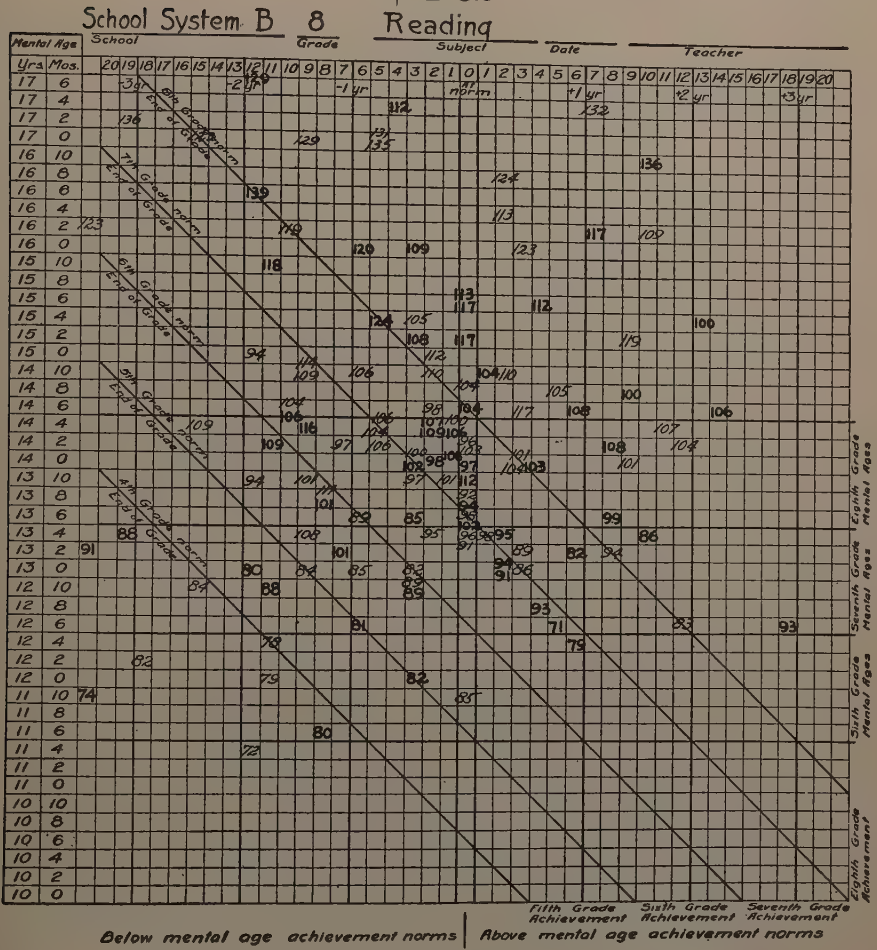
PLATE 31



CLASS RECORD CARD - B

mental age. The pupils with intelligence quotients around 117 gain two years four months in mental age during two years. Only a small proportion of these pupils will skip grades and many with even higher intelligence quotients will not. Consequently the range of mental ages tends to become wider in the upper grades. Along with this tendency goes the increasing variability in achievement in the upper grades. The range of

PLATE 32



CLASS RECORD CARD - B

reading abilities is nearly one and a half times as great at the end of the eighth grade (Plate 32) as at the end of the sixth grade (Plate 31). And this has also been accompanied by an increasing variability in quality of work. As these tendencies work to add to the teaching problems and the teaching difficulties in the upper grades, they need to be watched with extreme care.

CHAPTER VI

EDUCATIONAL MEASUREMENTS AS AN AID TO SUPERVISION IN A SMALL CITY SCHOOL SYSTEM

The effectiveness of supervision in a school system is dependent upon several important factors: the confidence of the teachers in the superintendent's or supervisor's professional integrity, his range of professional information and his ability to show the teachers what needs to be done. Quite as important as these is an intimate and accurate knowledge of the actual instructional conditions in each classroom. Significant as information regarding the composition, achievement and quality of work of each grade may be to the superintendent, a knowledge of the composition, attainment and quality of work of each class is equally essential for effective supervision. As subjective estimations of these features are largely biased and command but little confidence, educational measurements form the very basis for adequate supervision. Where the relative emphasis upon the different phases of instruction is found to vary significantly from class to class a corrective distribution of emphasis needs to be planned and suggested for each class. In classes where a certain group of pupils—either the girls or the boys, the gifted or the less gifted pupils—is found to have been neglected, this condition should be called to the attention of the teacher. On the basis of the mental age, the rate of gain in mental age, the previous attainment and the quality of work of each pupil reasonable and definite goals of achievement should be set up for each class through a conference of the teacher and supervisor. In cases where a poor quality of work or special disabilities are discovered, the need for diagnostic testing and remedial work should be suggested to the teacher. Such features as these are attainable, however, only on the basis of an adequate testing program.

A Common Misuse of Educational Measurements. In the supervision of instruction the judgment of the quality of the teacher's work oftentimes overshadows the real function of supervision. Too often these judgments are made on the basis of subjective estimations. But even where objective measurements of the achievement of the pupils are taken into account they are frequently misinterpreted. The following case is one where such a misinterpretation might readily have been made even though a very complete series of educational tests was used. At the end of the year a sixth-grade class was found to be doing only 5B work in reading, the B indicating the standard that should be expected at the middle of the grade, 7A work in spelling, the A indicating the attainment that should be expected at the end of the grade, 4B work in the information phase of American history, 6B work in the thought phase of American history, 5A work in the information phase of geography, 6B work in the thought phase of geography, 7A work in the fundamental operations of arithmetic, and 6B work in arithmetic problems. In only two subjects—spelling and the fundamental operations of arithmetic—was the work up to the sixth-grade standard. In these the pupils were a grade in advance of the norm. In the thought phase of history, geography and arithmetic they had failed to reach the sixth-grade standard by about half a year. In the information phase of American history and geography as well as in reading for comprehension they were a year or more below the sixth-grade standard. The distribution of emphasis from one phase of school work to another had obviously been very uneven. But this was true of the school as a whole. Throughout the school children stood unusually high in the tool subjects of spelling and arithmetic. But that the pupils in the 6A class should have attained the 6A norm in no other phase of instruction would seem like a severe indictment of the teacher's efficiency. This use of tests has been made all too frequently and is undoubtedly responsible for the unfavorable attitude of some teachers toward the testing movement. Two important factors are usually left out of account in such measurements. Even though these pupils stood low in achievement they might have made more than a normal amount of progress during the sixth grade. No tests were made at the beginning of the grade whereby the gains might have been computed. Furthermore, the mere fact that the class had been labelled a 6A class was no evidence that it was a 6A class in capacity to achieve. It might have varied anywhere from a 5A class to a 7A class in mental age.

The achievement measurements in this class were not only more complete than is usually the case but a mental test was also used, and one whose mental ages had been co-ordinated with the scores on the achievement scales. On the basis of this mental test the class mental age was found to be a 5A-class mental age. The teacher had been discouraged with the achievement of the class and well she might have been. Very easily might the supervisor have grossly misjudged the quality of her work. But the mental test record indicated superior achievement for the class except in two phases of instruction. And in these the school as a whole stood low. When used alone and at the end of the year only, the achievement tests may result in very inadequate judgments regarding the quality of a teacher's achievements. When used along with a mental test and with the co-operation of the teacher to discover where changes in the instructional conditions seem advisable, the achievement scales are an indispensable aid in supervision.

How the Results from Mental Tests and Achievement Scales May Be Used to Discover Needed Changes in Instructional Conditions. An examination of the distributions of mental ages and scores for the four sixth-grade classes of school system B on Plate 33 reveals but slight differences in the class mental ages and reasonably narrow ranges of mental ages. Nevertheless the four pupils in schools N and O with mental ages above the eighth-grade norm are in need of special consideration. Their acquaintance has already been made on Plates 27, 28, 29 and 31, on which their intelligence quotients of 119, 124, 130 and 141 appear above the upper heavy horizontal eighth-grade mental-age norm line. In the fundamental operations of arithmetic and in reading they are already surpassing the seventh-grade achievement norms by half a year. In spelling they have done poorly and in American history still worse. Yet their promotion to the eighth grade rather than to the seventh would seem advisable. Other pupils somewhat younger in mental age but doing a superior quality of work should also be considered for an extra promotion. These include the pupils with the mental ages of 14 years or above and intelligence quotients of 120 and 137. In school O somewhat more rapid promotion may well be suggested even though the class is only half a year older in mental age. At the end of the sixth grade the pupils from all four schools go to a single building where they are no longer kept in the same classes. For this reason any variations in achievement from school to school will also be significant.

As one follows the little black squares, indicating the class scores of the sixth grade in school L, across Plate 33, this class, which has a mental age somewhat below that of a normal sixth-grade class, is doing sixth-grade work in the thought phase of geography alone. In reading, the fundamental operations of arithmetic and arithmetic problems the class score is only slightly below the class mental-age norm. In the thought phase of American history it is still farther below, while in spelling and the information phase of both American history and geography the class score is fully a year below the class mental-age norm. While the attainment of this class is below its mental age norm in all but one phase of work it drops only about a year below in any phase. The fluctuations are not excessive.

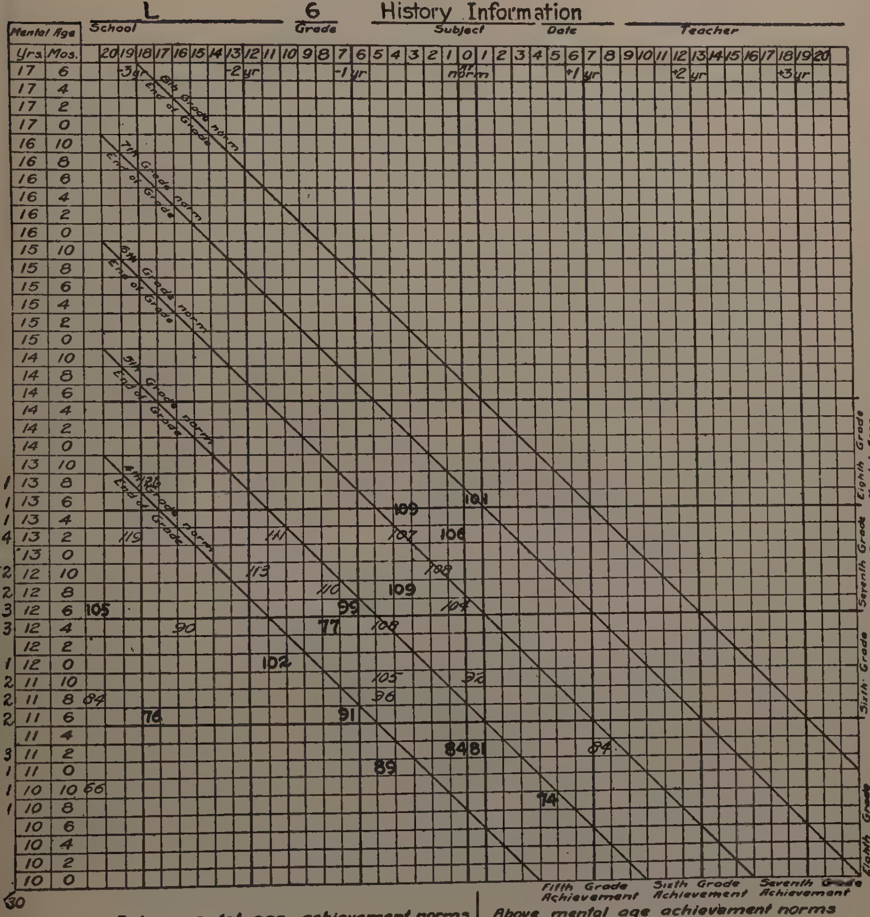
The sixth-grade class in school M has almost the same class mental age as class L. In the fundamental operations of arithmetic alone is the class score above the sixth-grade norm and in this it is nearly two years above the class mental-age norm. It is doing only slightly below normal work in spelling. In the thought phase of American history, in both phases of geography and in arithmetic problems the class score is nearly a year or slightly more below the mental-age class score. It is more than three years below the norm in the information phase of American history. The fluctuations from the class mental-age norm are far more marked in school M than in school L.

School N with the same class mental age as the two previous schools is doing about normal sixth-grade work in both the information and thought phases of geography and in the fundamental operations of arithmetic but only fifth-grade work or less in spelling, reading and the thought phase of American history and arithmetic, and less than third-grade work in the information phase of American history. In both the information and thought phases of American history the class stands lower than any one of the other three classes, yet in both phases of geography it has the highest attainment of the four classes. While school L has practically the same class achievement score in the information phase of both American history and geography, school N differs from one subject to the other by more than three grades. In both phases of arithmetic school L makes the same score, yet school N differs in the two phases by two grades. Such wide variations in the same school system loudly call for more effective supervision of instruction.

A much more even emphasis from one phase of instruction to another is evident from the downward pointing black triangles indicating the class scores in school O. In mental age, reading, the thought phase of American history as well as in the fundamental operations of arithmetic, the class scores are somewhat above the sixth-grade norms. Although it is only slightly more than a half grade below the sixth-grade norm in spelling, it is still less below in the thought phase of geography and arithmetic. In the information phase of American history it is two years below the sixth-grade norm, but even this is a year and a half higher than the class score of school N. Of all the phases of instruction the information phase of American history is obviously most in need of greater emphasis in this school system.

For Pointing Out the Prevailing Instructional Conditions to a Teacher the Class Cards Are More Effective than Class Scores. Although school L made the highest class score in the information phase of American history, the record on Plate 34 suggests that the seventh-grade teachers will need to give much extra emphasis to American history to insure that the pupils of this class attain their mental-age norms at the end of the seventh grade. Only nine pupils surpass the fifth-grade achievement norm and just as many are below the fourth-grade achievement norm. Although only two pupils are doing better than an average quality of work, that of the class as a unit is less than a year below the average. The condition of this class can be remedied during the seventh grade. To prevent its recurrence in succeeding classes, however, additional emphasis is needed on American history during the sixth grade and probably during the earlier grades also.

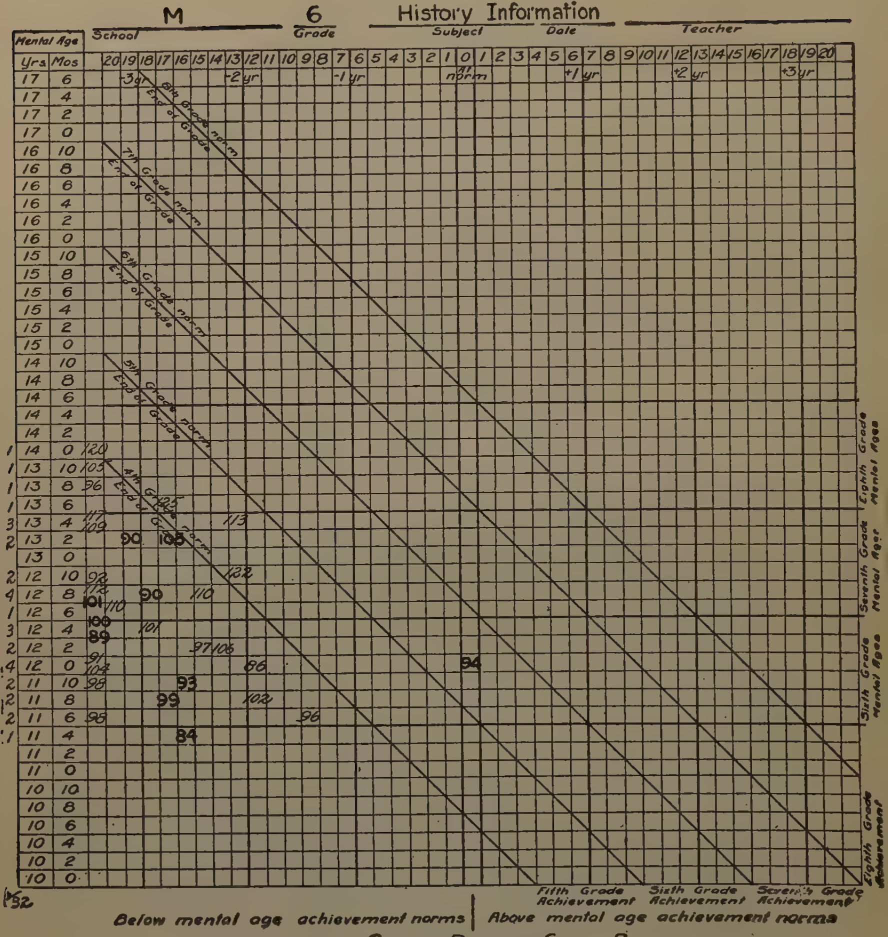
PLATE 34



CLASS RECORD CARD - B

The record for school M (Plate 35) is even more striking although it is not the worst record for the four schools. In quality of work the class is more than three years below the average. Only five pupils have a wider range of information than should be expected of an average fourth-grade pupil. However much the teaching of American history may have been neglected in the sixth grade, the sixth-grade teacher is not responsible for the three years' retardation of these pupils. This is a

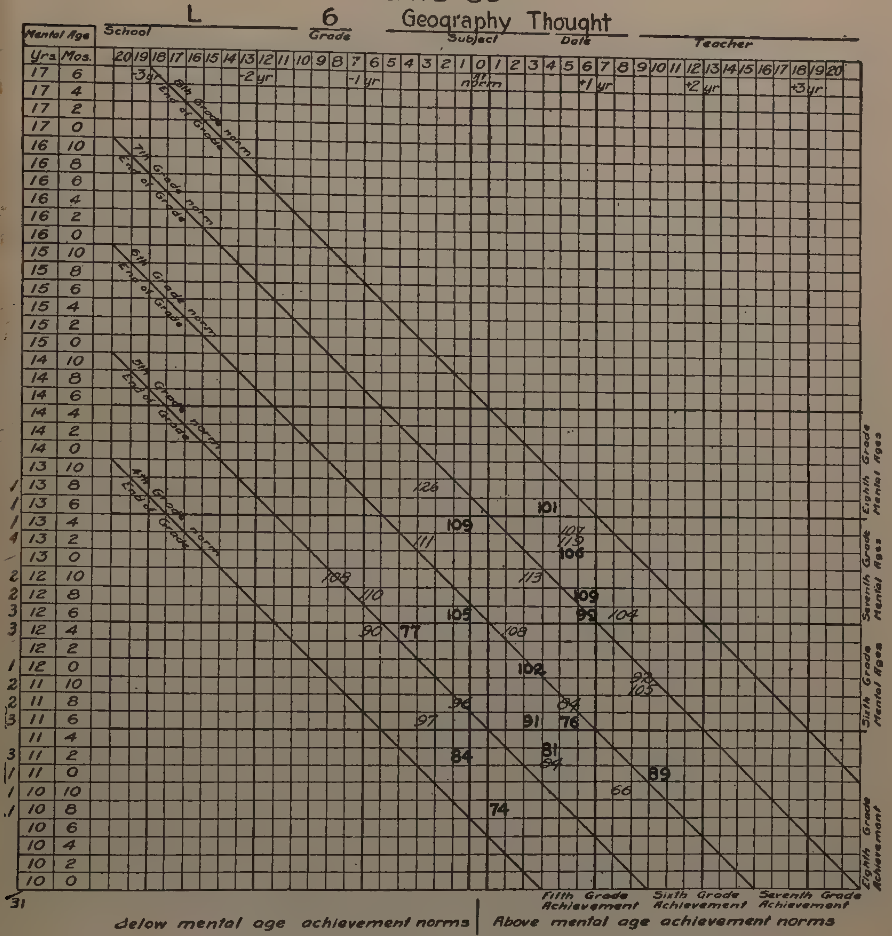
PLATE 35



CLASS RECORD CARD - B

condition for which the principal must also assume responsibility. Immediate measures for correcting this tendency are imperative. Although they do stand low in achievement and quality of work, the majority of the pupils in this class would be misfits even with the pupils of class L. The seventh-grade teachers can hardly hope to teach these pupils a seventh-grade content nor can they teach them effectively in a class with even so low as fifth-grade achievement. The necessity of maintaining common

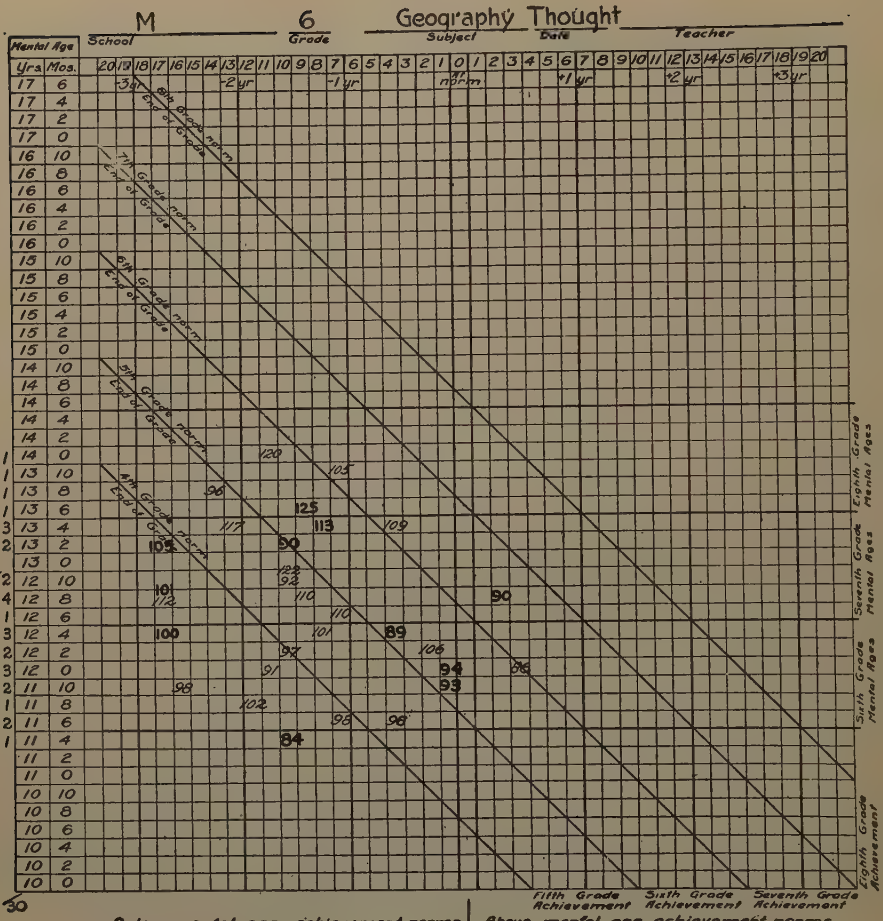
PLATE 36



CLASS RECORD CARD - B

standards of achievement where the pupils from several different schools are to be regrouped in one large school is obvious. Uniform standards, however, do not imply any need for mechanizing the work of the class nor do they even imply uniformity in methods of teaching. They do imply some degree of uniformity in emphasis and quality of work from school to school. To secure these conditions is one of the serious supervisory problems in this school system. In school M it involves

PLATE 37

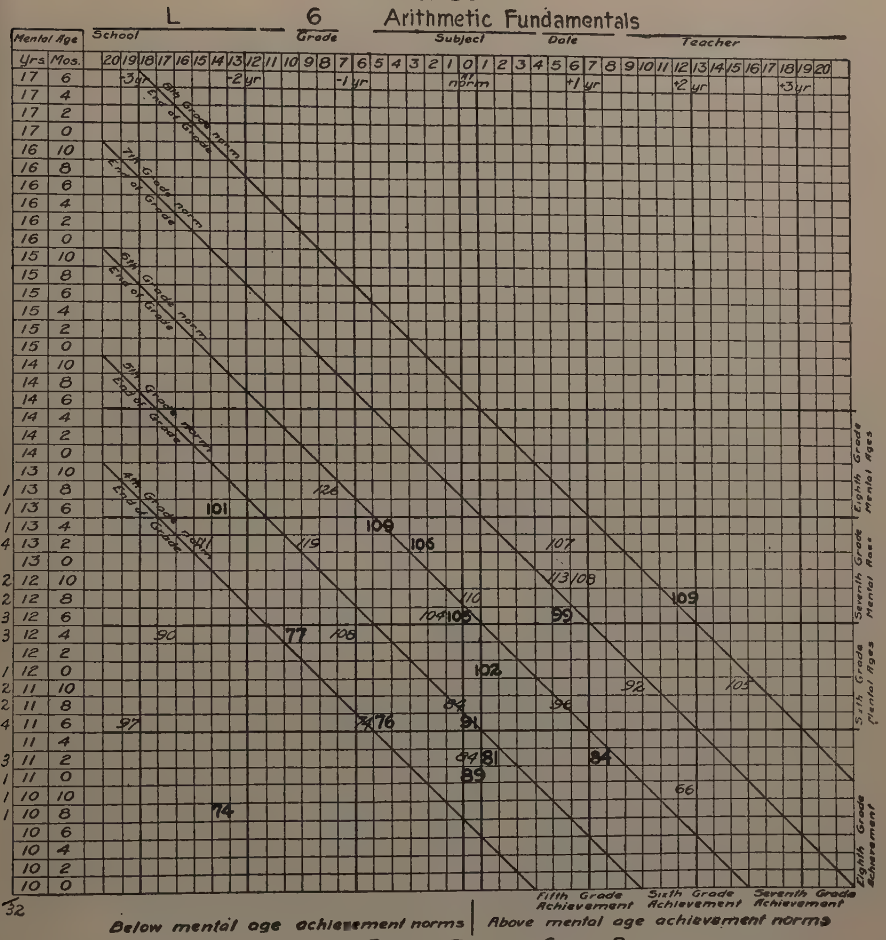


CLASS RECORD CARD – B

a complete change in the attitude toward the teaching of history.

The record of the geography thought scale on Plate 36 is a refreshing surprise. The class is doing slightly better than an average quality of work and has a fairly uniform quality; most of the pupils have scored somewhat above their mental-age norms while the scores of the others are not far below their mental-age

PLATE 38

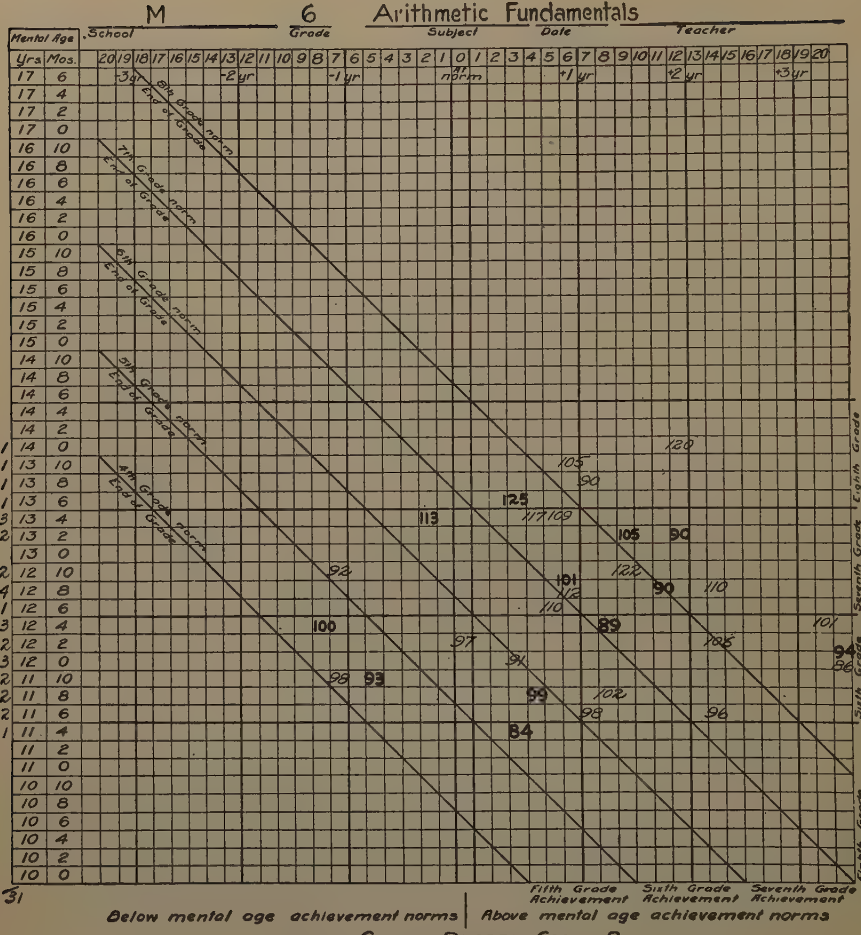


CLASS RECORD CARD - B

norms. The range of scores does not spread out more than a grade and a half on either side of the oblique sixth-grade achievement norm line. This is but little more than the spread of mental ages. The attention of the teacher has evidently been fairly evenly distributed among the girls and boys as well as among the mentally older and the less gifted pupils.

The information phase of American history was certainly not neglected for the thought phase of geography in class M. Al-

PLATE 39



CLASS RECORD CARD - B

though Plate 37 presents a far better record than Plate 35, only two of the pupils are doing better than an average quality of work and only four are reaching the sixth-grade achievement norm. In both quality of work and actual achievement the class is a year and a half below the average. This condition still further misfits the pupils of class M to be grouped with those of class L.

In the fundamental operations of arithmetic (Plate 38) class

L is again doing an average quality of work. The variability in quality of work is strikingly wide, however, in contrast with that on Plates 34 and 36. Too much leeway may have been given to the pupils' likes and dislikes in the study of arithmetic, for an even worse condition is found in arithmetic problems.

It is in the fundamental operations of arithmetic (Plate 39) that school M rises above mediocrity. A large number of the pupils are making eighth-grade achievement records. Very few fall below the sixth-grade achievement norm. In quality of work the class is fully a year above the average. Evidently range of information in American history and the ability to solve problems involving geographical facts have been sacrificed for the attainment of an unusual ability to do tasks in arithmetic. Even spelling has been underemphasized to a greater extent than in the other three schools. Can the fundamental operations of arithmetic possibly be so much more worth while to any group of children than the ability to read or to spell, than information or the ability to solve problems in the content subjects of history and geography? It seems more likely to be a case where supervision is urgently needed to correct certain peculiar tendencies in the distribution of emphasis among the various phases of instruction.

CHAPTER VII

DISCOVERING THE INSTRUCTIONAL CONDITIONS IN A LARGE CITY SCHOOL SYSTEM

In a Large City System Classes in the Same Grade May Differ Widely in Capacity to Achieve in School. We commonly think of sixth-grade classes as being made of pupils very much alike in mental age and school attainments. That sixth-grade classes closely resemble one another we take for granted. When a pupil transfers from one school to another within the same system he is not likely to be demoted even though pupils entering from schools outside the system are commonly started somewhat lower than the grade label they bear. In the large city school as well as in the small town school pupils in the same class vary widely in mental ages. In each of the three sixth-grade classes whose distributions of mental ages and scale scores are given on Plate 40 the variation in mental ages is five years or more. But more striking is the variation in the class mental ages. The sixth-grade class in school P with a class mental age of 11 years 9 months, as designated by the little black square, is more than a year below that of school Q, with a class mental age of 12 years 11 months, as designated by the little black circle. The sixth-grade class in school R, with its class mental age of 13 years 11 months, designated by the little black triangle, is more than a year above that of school Q. In class mental age these three sixth-grade classes of the same school system are a year or more apart. The same classes in schools P and R differ from one another more widely in class mental ages than do normal fifth-grade and seventh-grade classes. The class labelled grade 6 at the end of the year in school P is only slightly better than a beginning sixth-grade class while that designated sixth grade in school R has a class mental age nearly as high as the normal class nearly half way through the eighth grade. Only three pupils of the class in school R, even with its wide range in mental ages, have mental ages lower than the class mental age of class P. Only five are mentally as young as the average sixth-grade pupil. In class P only two of the pupils have higher mental ages than the class mental age of class R. Widely as the pupils of class Q differ from one another in mental age all but nine of them lie within the difference of the P and R class mental ages.

But in attainment these classes must surely differ much less from one another than they do in class mental ages. Otherwise why would they all be called by the same grade designation? In spelling they plainly do. The P class has a class score somewhat higher than its mental age norm of 49½. The R class is considerably more than a half grade below its mental age norm of 58. Even with these opposite changes from their mental age norms the two classes are still more than a year apart in attainment in spelling. In reading ability classes P and Q differ as widely in class scores as they do in class mental ages. The low record of class R in comparison with its mental age norm of 56½ alone saves the classes from varying as widely in reading ability as in mental age, as well they might. In range of information in American history classes Q and R differ by only a half grade owing to the fact that class R falls still farther below its mental age norm than does class Q. But the two classes differ from class P by two and two and a half years respectively. Class Q alone is doing normal work in the thought phase of American history. Class R has even fallen below it in class score, while class P is nearly three years below either. A similar situation, though not so marked, exists in the information and thought phases of geography. In the fundamental operations of arithmetic the arrangement of the class scores is almost identical with that in spelling. Class P surpasses its mental age norm while class R again falls more than a half grade below. The variation in the class scores in arithmetic problems is again smaller than that in class mental ages. While class P is more than half a year below its mental age norms, class Q is a year below and class R is more than two full years below. Wherever the differences in attainments are narrower than those in mental ages it is almost entirely due to the inferior work of class R. In very few phases of school work are these three classes achieving up to their class norm. Class R falls below in everything, class Q in everything but the thought phase of history; class P surpasses its class mental-age norms in spelling and the fundamental operations of arithmetic. In the information phase of geography the R class alone reaches the sixth-grade norm. Not one of the three classes attained the sixth-grade norm in either the thought phase of geography or arithmetic problems. In range of information in American history not one class score came within two full grades of the sixth-grade norm and only two pupils in the three classes surpassed it. Attainment even less than mental age can account for the P class being labelled a sixth grade. It may, but surely should not account for the R class, with its superior group pupils, being thus labelled.

Pupils in the Same Grade Differ Widely in Intelligence Quotients as Well as in Mental Ages. Nor is the relation the one normally to be expected. Were pupils with low mental ages but high rates of achievement placed with higher mental ages but low rates of achievement there might be a reasonable hope perhaps of teaching them in the same group. But when pupils differ in the same direction in both tendencies and as markedly and regularly as Plate 41 shows them to differ in the case of the 1300 sixth-grade girls and boys of the same school system, the prospects of teaching them in the same classes are anything but encouraging. If the less gifted can be brought up toward the average we surely do not want to bring the superior children down toward the average. A levelling up in quality of work is far more important than any levelling down in attainment. A democratic school system should mean an equal opportunity for the superior children as well as for the less gifted to build up efficient methods of study, effective ways of attacking their tasks and excellent habits of work.

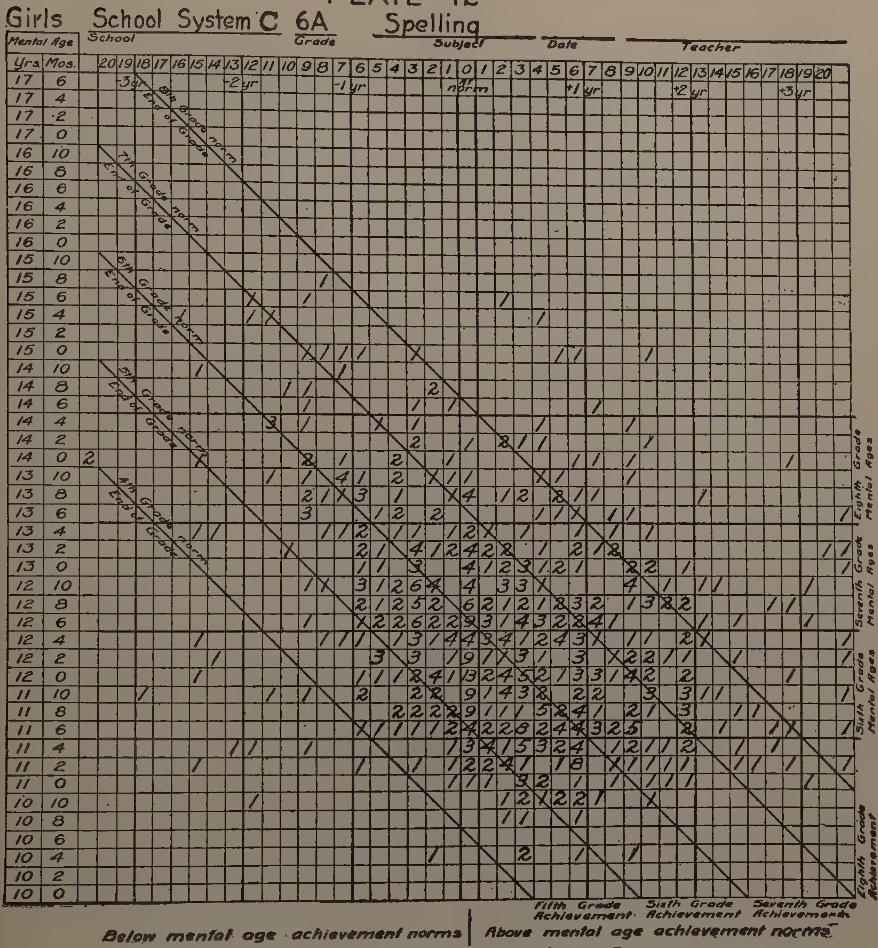
In mental ages the middle fifty per cent (52.8%) of this sixth grade range from 11 years 9 months through 13 years 2 months, a difference of approximately eighteen months or a grade and a half. The range in intelligence quotients for the middle fifty per cent (52.4%) is from 92 through 111, with a mid intelligence quotient of 101. Of the upper quarter in mental ages, those with mental ages above 13 years 2 months, only three in the entire group have intelligence quotients below 92 and only 19 or less than one and one-half per cent have intelligence quotients below 101. Among the less gifted pupils the condition is quite the reverse. Of those making up the lower quarter of the grade in mental ages only one pupil with a mental age of less than 13 years 9 months has an intelligence quotient above 111, and only eight, or less than two-thirds of one per cent, have intelligence quotients above 101. Among those within the middle fifty per cent in mental ages there are a few pupils with intelligence quotients of 80 or less and some with intelligence quotients of 120 or more. Even within this mental-age group pupils differ not only by nearly a grade and a half in mental age but in rate of achievement some can accomplish in eight months as much as others can accomplish in twelve. And, for the most part, those with higher rates of achievement also have the higher mental ages.

When one compares the lower and upper quarters of this sixth grade in mental ages and intelligence quotients the feasibility of teaching them as a unit seems well-nigh hopeless. Nor may it even be desirable. The group, the best of whom have mental ages only a little above those of beginning sixth-grade children and the most of whom have intelligence quotients below 90, can hardly work successfully with the same content as the group with mental ages higher than those of average pupils at least two thirds the way through the seventh grade and intelligence quotients of 110 and above. In median achievement attainments in all their school work except spelling the two groups differ from three fourths as much to just as much as they differ in median mental ages. In few classes do the superior and less gifted children both receive as much of the teacher's attention as do the average pupils. Either one group or the other are likely to be neglected. And it is usually the superior pupils who are left to shift for themselves.

Another striking and significant contrast between the two groups is the amount of their spread in mental ages. Among the pupils with the higher mental ages this spread is from one and a half to two times as great as among the less gifted pupils. The less gifted pupil's chances of being left behind are nowhere nearly as great as the gifted pupil's chances of remaining undetected or unstimulated. Seventy of the 1299 pupils have mental ages higher than that of the average eighth-grade pupil at graduation and only six of the seventy-five have intelligence quotients below 120. In this school system an alpha class has been formed to take care of a part of these gifted children. The need for such classes in every school system is evident.

The Girls and Boys in the Same Grade May Differ in Quality of Work Throughout a Large City System. In classes this is a common occurrence. That it should occur in any grade throughout an entire school system is less to be expected. Yet in the early measurements of achievement in American history, geography and general science the boys were found to surpass the girls by nearly a year in range of information. In the thought phase of both American history and geography the boys were also found to surpass the girls but to a smaller extent. How much of this difference may have been due to a difference in mental age can not be determined but there is good reason to believe that a part of it may have been. In the case of the sixth grade of school system C the boys are mentally three months older than the girls. In spelling ability the educational ages of the girls are on the average three months in advance of those of the boys. Thus, when the mental ages are taken into consideration, the girls are half a year in advance of the boys in attainment in spelling. One condition responsible for this difference shows up very clearly in a comparison of Plates 42 and 43, on which the data for spelling are tabulated separately for the girls and boys. A much larger proportion of the girls are doing a quality of work a year or more above the average than are doing a quality of work a year or more below the average. On Plate 43, which contains the data for the boys, just the opposite tendency is evident. Furthermore, on Plate 42 the concentration of the cases is on the right side of the "At norm" column while on Plate 43 it is at the left. It is possible that the girls may have a greater capacity to learn to spell than the boys just as the boys may have a greater capacity to acquire information than have the girls. Both tendencies may be due to differences in social needs or to differences in interests. That the variations in achievement in spelling are not due to any need for differentiation felt by the teachers is evidenced by the fact that it comes as a distinct surprise to teachers. The further

PLATE 42

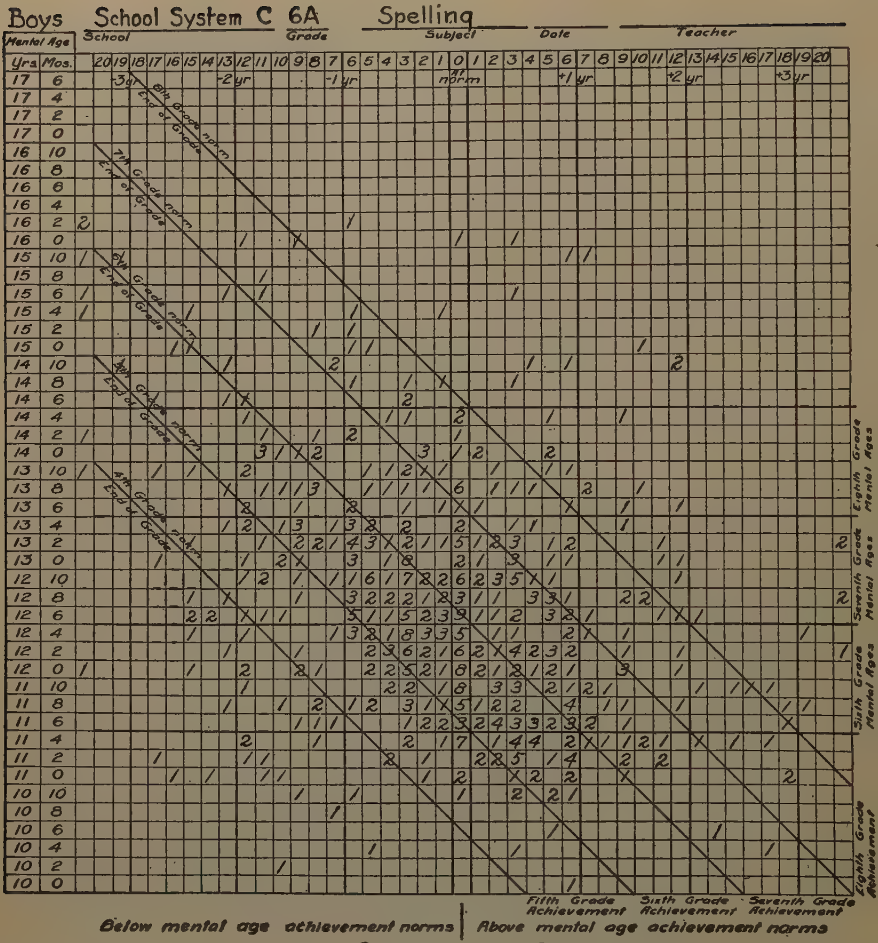


CLASS RECORD CARD - B

tendency for the differences to be smoothed out as soon as they are discovered or even turned in the opposite direction in some classes makes any assumption as to their being due to differences in capacity or interests seem highly questionable.

The Superior and Less Gifted Pupils in the Same Grade May Also Differ in the Quality of Their Work Throughout a Large City School System. This is strikingly evident for both the girls and boys in the thought phase of geography in the same

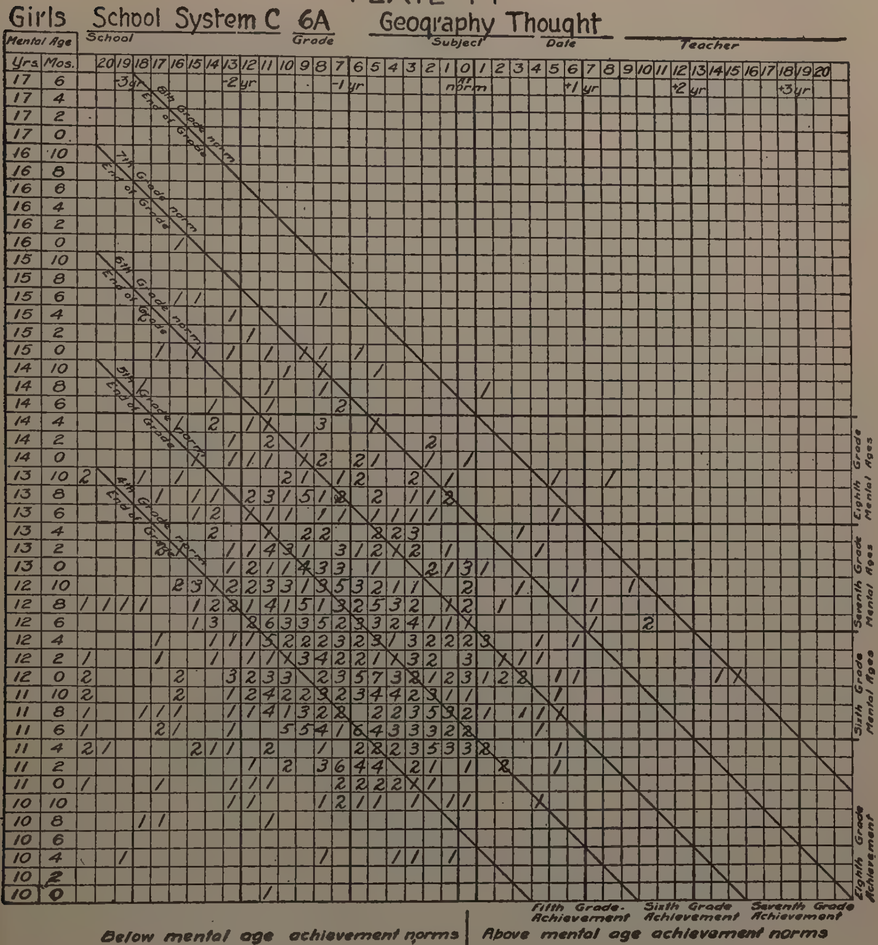
PLATE 43



CLASS RECORD CARD - B

sixth grade. For the girls with mental ages of 13 years 0 months and above, the quality of work of the group (Plate 44) is nine points below the average or nine points below the mental-age norms of these pupils. The corresponding quality of work for the girls with mental ages less than 11 years 10 months is six points below the average. The less gifted girls are thus doing a quality of work three scale points or half a year in advance

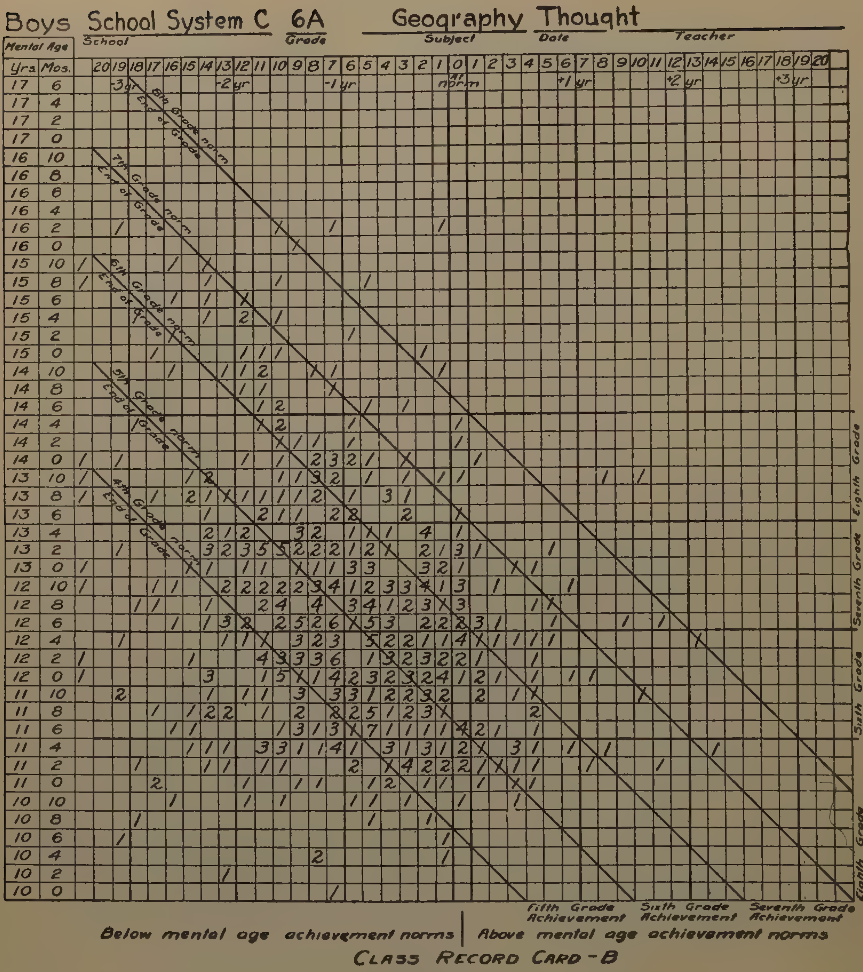
PLATE 44



CLASS RECORD CARD - B

of that of the superior girls in the same grade. In the case of the boys the less gifted pupils are doing a quality of work only five points below the average as compared with eight points below the average for the superior pupils. Again the less gifted pupils are half a year in advance of the superior pupils in quality of work. The slight superiority of both groups of boys over the corresponding groups of girls is explained by a similar difference

PLATE 45



in mental ages. The smaller spread of the marks across Plates 44 and 45 than on Plates 42 and 43 indicates a smaller variability in quality of work in the thought phase of geography than in spelling.

In comparing the mental ages of the upper and lower groups of girls and boys on Plates 44 and 45 a significant difference in the proportions is at once evident. In the case of the girls

26.6 per cent have mental ages of 13 years 0 months and above while 32.4 per cent of the boys have similar mental ages. As compared with 28.5 per cent of the girls with mental ages below 11 years 10 months there are only 24.8 per cent of the boys with similar mental ages. It is apparent that the less gifted girls have not only not been held back in lower grades to the same extent as the less gifted boys but that the superior girls have been more rapidly promoted than the superior boys. Fewer are found in the sixth grade although a larger per cent of the less gifted girls are found there.

Were it not for the facts in Table 1, this tendency for the more rapid promotion of the girls might be ascribed to a better quality of work in general. The fact is, however, that they are not only lower in achievement and in mental ages but also in quality of work although the difference is very slight in the latter. The three phases of instruction in which the girls surpass the boys in quality of work and in which they equal the boys in achievement—in spelling they surpass the boys in achievement also—are spelling, reading, and the fundamental operations of arithmetic. It is not improbable that these subjects may count more heavily in promotions than do the content subjects.

Pupils of the Same Mental Age Differ Widely in Achievement. How widely girls or boys of any mental age are likely to vary from one another in achievement even in the same grade in the same school system is indicated by the spread of the cases in any mental-age row on Plates 42 through 45. The girls with a mental age of 12 years 6 months to 12 years 8 months vary in spelling scores (Plate 42) from below the fifth-grade norm to well above the eighth-grade norm. This wide variation in achievement is characteristic of all mental-age groups in all phases of school work. Of course, the variation of abilities is somewhat less than the variation of the scale scores, owing to a certain degree of unreliability of both the mental ages and the scale scores. The amount of shrinkage in the variations would be relatively small, however, were absolute measures substituted for the single scale measures.

The numbers and also the proportions of pupils of each grade mental-age group to be found in each grade achievement group

PLATE 42b

School System C	6A	Spelling		
SCHOOL	GRADE	SUBJECT	DATE	TEACHER

MENTAL-AGE GRADE-ACHIEVEMENT TABLE

DISTRIBUTION OF ACHIEVEMENT SCORES OF PUPILS WITH REFERENCE TO GRADE ACHIEVEMENT NORMS.

DISTRIBUTION OF MENTAL AGES OF PUPILS WITH REFERENCE TO GRADE MENTAL-AGE NORMS

	BETTER THAN 8TH GRADE	BETWEEN 7TH AND 8TH	BETWEEN 6TH AND 7TH	BETWEEN 5TH AND 6TH	BETWEEN 4TH AND 5TH	BELOW 4TH GRADE	Total
ABOVE 8TH GRADE MENTAL AGE NORM. ABOVE 14 YRS., 6 MO.	6	11	8	1			26
BETWEEN 7TH AND 8TH GRADE MENTAL AGE NORMS 13 YRS. 6 MO. TO 14 YRS. 6 MO.	17	22	23	14	1	2	79
BETWEEN 6TH AND 7TH GRADE MENTAL AGE NORMS 12 YRS. 6 MO. TO 13 YRS. 6 MO.	19	34	71	63	7		194
BETWEEN 5TH AND 6TH GRADE MENTAL AGE NORMS 11 YRS. 6 MO. TO 12 YRS. 6 MO.	6	28	64	120	35	7	260
BETWEEN 4TH AND 5TH GRADE MENTAL AGE NORMS 10 YRS. 6 MO. TO 11 YRS. 6 MO.	1	6	14	37	30	6	94
BELOW 4TH GRADE MENTAL AGE NORM. BELOW 10 YRS., 6 MO.				1	3	1	5
	49	101	180	236	76	16	658

CAPACITY-APPROXIMATION GRADE-ACHIEVEMENT TABLE

DISTRIBUTION OF ACHIEVEMENT SCORES OF PUPILS WITH REFERENCE TO GRADE ACHIEVEMENT NORMS.

DISTRIBUTION OF VARIATIONS OF PUPILS FROM AVERAGE ACHIEVEMENT WITH REFERENCE TO MENTAL-AGE NORMS.

	BETTER THAN 8TH GRADE	BETWEEN 7TH AND 8TH	BETWEEN 6TH AND 7TH	BETWEEN 5TH AND 6TH	BETWEEN 4TH AND 5TH	BELOW 4TH GRADE	Total
2 OR MORE YRS. ABOVE MENTAL AGE ACHIEVEMENT NORM.	21	14					35
1 TO 2 YEARS ABOVE MENTAL AGE ACHIEVEMENT NORM.	18	42	45	5			110
0 TO 1 YEAR ABOVE MENTAL AGE ACHIEVEMENT NORM.	10	23	74	91	23		221
AT MENTAL AGE ACHIEVEMENT NORM.		6	20	53	10		89
0 TO 1 YEAR BELOW MENTAL AGE ACHIEVEMENT NORM.		11	27	70	34	3	145
1 TO 2 YEARS BELOW MENTAL AGE ACHIEVEMENT NORM.		5	13	16	6	5	45
2 OR MORE YRS. BELOW MENTAL AGE ACHIEVEMENT NORM.			1	1	3	8	13
	49	101	180	236	76	16	658

PLATE 43b

School System C	6A	Spelling		
SCHOOL	GRADE	SUBJECT	DATE	TEACHER

MENTAL-AGE GRADE-ACHIEVEMENT TABLE

DISTRIBUTION OF ACHIEVEMENT SCORES OF PUPILS WITH REFERENCE TO GRADE ACHIEVEMENT NORMS.

DISTRIBUTION OF MENTAL AGES OF PUPILS WITH REFERENCE TO GRADE MENTAL-AGE NORMS

	BETTER THAN 8TH GRADE	BETWEEN 7TH AND 8TH	BETWEEN 6TH AND 7TH	BETWEEN 5TH AND 6TH	BETWEEN 4TH AND 5TH	BELOW 4TH GRADE	Total
ABOVE 8TH GRADE MENTAL AGE NORM. ABOVE 14 YRS., 6 MO.	13	16	6	9			44
BETWEEN 7TH AND 8TH GRADE MENTAL AGE NORMS 13 YRS. 6 MO. TO 14 YRS. 6 MO.	11	24	17	18	6	1	77
BETWEEN 6TH AND 7TH GRADE MENTAL AGE NORMS 12 YRS. 6 MO. TO 13 YRS. 6 MO.	10	19	61	86	21	9	206
BETWEEN 5TH AND 6TH GRADE MENTAL AGE NORMS 11 YRS. 6 MO. TO 12 YRS. 6 MO.	5	9	38	96	42	17	207
BETWEEN 4TH AND 5TH GRADE MENTAL AGE NORMS 10 YRS. 6 MO. TO 11 YRS. 6 MO.		4	11	30	23	15	83
BELOW 4TH GRADE MENTAL AGE NORM. BELOW 10 YRS., 6 MO.			1		2	1	4
	39	72	134	239	94	43	621

CAPACITY-APPROXIMATION GRADE-ACHIEVEMENT TABLE

DISTRIBUTION OF ACHIEVEMENT SCORES OF PUPILS WITH REFERENCE TO GRADE ACHIEVEMENT NORMS.

DISTRIBUTION OF VARIATIONS OF PUPILS FROM AVERAGE ACHIEVEMENT WITH REFERENCE TO MENTAL-AGE NORMS.

	BETTER THAN 8TH GRADE	BETWEEN 7TH AND 8TH	BETWEEN 6TH AND 7TH	BETWEEN 5TH AND 6TH	BETWEEN 4TH AND 5TH	BELOW 4TH GRADE	Total
2 OR MORE YRS. ABOVE MENTAL AGE ACHIEVEMENT NORM.	10	8	3				21
1 TO 2 YEARS ABOVE MENTAL AGE ACHIEVEMENT NORM.	15	12	21	2			50
0 TO 1 YEAR ABOVE MENTAL AGE ACHIEVEMENT NORM.	11	20	61	64	10		166
AT MENTAL AGE ACHIEVEMENT NORM.	1	10	19	41	13		84
0 TO 1 YEAR BELOW MENTAL AGE ACHIEVEMENT NORM.	2	15	21	96	46	4	184
1 TO 2 YEARS BELOW MENTAL AGE ACHIEVEMENT NORM.		7	3	28	19	23	80
2 OR MORE YRS. BELOW MENTAL AGE ACHIEVEMENT NORM.			6	8	6	16	36
	39	72	134	239	94	43	621

PLATE 44b

School System C — SCHOOL
6A — GRADE
Geography — SUBJECT
Thought — DATE
— TEACHER

MENTAL-AGE GRADE-ACHIEVEMENT TABLE

DISTRIBUTION OF ACHIEVEMENT SCORES OF PUPILS WITH REFERENCE TO GRADE ACHIEVEMENT NORMS.

DISTRIBUTION OF MENTAL AGES OF PUPILS WITH REFERENCE TO GRADE MENTAL-AGE NORMS

	BETTER THAN 8TH GRADE	BETWEEN 7TH AND 8TH	BETWEEN 6TH AND 7TH	BETWEEN 5TH AND 6TH	BETWEEN 4TH AND 5TH	BELOW 4TH GRADE	Total
ABOVE 8TH GRADE MENTAL AGE NORM. ABOVE 14 YRS., 6 MO.	1	4	15	6			26
BETWEEN 7TH AND 8TH GRADE MENTAL AGE NORMS 13 YRS. 6 MO. TO 14 YRS. 6 MO.	2	6	25	33	10	2	78
BETWEEN 6TH AND 7TH GRADE MENTAL AGE NORMS 12 YRS. 6 MO. TO 13 YRS. 6 MO.		8	21	58	72	24	183
BETWEEN 5TH AND 6TH GRADE MENTAL AGE NORMS 11 YRS. 6 MO. TO 12 YRS. 6 MO.		2	7	42	99	92	242
BETWEEN 4TH AND 5TH GRADE MENTAL AGE NORMS 10 YRS. 6 MO. TO 11 YRS. 6 MO.				2	28	59	89
BELOW 4TH GRADE MENTAL AGE NORM. BELOW 10 YRS., 6 MO.						6	6
	3	20	68	141	209	183	624

CAPACITY-APPROXIMATION GRADE-ACHIEVEMENT TABLE

DISTRIBUTION OF ACHIEVEMENT SCORES OF PUPILS WITH REFERENCE TO GRADE ACHIEVEMENT NORMS.

DISTRIBUTION OF VARIATIONS OF PUPILS FROM AVERAGE ACHIEVEMENT WITH REFERENCE TO MENTAL-AGE NORMS.

	BETTER THAN 8TH GRADE	BETWEEN 7TH AND 8TH	BETWEEN 6TH AND 7TH	BETWEEN 5TH AND 6TH	BETWEEN 4TH AND 5TH	BELOW 4TH GRADE	Total
2 OR MORE YRS. ABOVE MENTAL AGE ACHIEVEMENT NORM.		2					2
1 TO 2 YEARS ABOVE MENTAL AGE ACHIEVEMENT NORM.	1	5					6
0 TO 1 YEAR ABOVE MENTAL AGE ACHIEVEMENT NORM.	2	4	10	16	5		37
AT MENTAL AGE ACHIEVEMENT NORM.		1	7	12	7		27
0 TO 1 YEAR BELOW MENTAL AGE ACHIEVEMENT NORM.		6	29	55	93	31	214
1 TO 2 YEARS BELOW MENTAL AGE ACHIEVEMENT NORM.		2	17	47	89	86	241
2 OR MORE YRS. BELOW MENTAL AGE ACHIEVEMENT NORM.			5	11	15	66	97
	3	20	68	141	209	183	624

PLATE 45b

School System C	6A	Geography	Thought	
SCHOOL	GRADE	SUBJECT	DATE	TEACHER

MENTAL-AGE GRADE-ACHIEVEMENT TABLE

DISTRIBUTION OF ACHIEVEMENT SCORES OF PUPILS WITH REFERENCE TO GRADE ACHIEVEMENT NORMS.

DISTRIBUTION OF MENTAL AGES OF PUPILS WITH REFERENCE TO GRADE MENTAL-AGE NORMS

	BETTER THAN 8TH GRADE	BETWEEN 7TH AND 8TH	BETWEEN 6TH AND 7TH	BETWEEN 5TH AND 6TH	BETWEEN 4TH AND 5TH	BELOW 4TH GRADE	Total
ABOVE 8TH GRADE MENTAL AGE NORM. ABOVE 14 YRS., 6 MO.	5	8	24	5	1		43
BETWEEN 7TH AND 8TH GRADE MENTAL AGE NORMS 13 YRS. 6 MO. TO 14 YRS. 6 MO.	2	5	27	23	11	3	71
BETWEEN 6TH AND 7TH GRADE MENTAL AGE NORMS 12 YRS. 6 MO. TO 13 YRS. 6 MO.		5	36	70	66	16	193
BETWEEN 5TH AND 6TH GRADE MENTAL AGE NORMS 11 YRS. 6 MO. TO 12 YRS. 6 MO.		1	9	44	87	54	195
BETWEEN 4TH AND 5TH GRADE MENTAL AGE NORMS 10 YRS. 6 MO. TO 11 YRS. 6 MO.		1	2	9	29	43	84
BELOW 4TH GRADE MENTAL AGE NORM. BELOW 10 YRS., 6 MO.						5	5
	7	20	98	151	194	121	591

CAPACITY-APPROXIMATION GRADE-ACHIEVEMENT TABLE

DISTRIBUTION OF ACHIEVEMENT SCORES OF PUPILS WITH REFERENCE TO GRADE ACHIEVEMENT NORMS.

DISTRIBUTION OF VARIATIONS OF PUPILS FROM AVERAGE ACHIEVEMENT WITH REFERENCE TO MENTAL-AGE NORMS.

	BETTER THAN 8TH GRADE	BETWEEN 7TH AND 8TH	BETWEEN 6TH AND 7TH	BETWEEN 5TH AND 6TH	BETWEEN 4TH AND 5TH	BELOW 4TH GRADE	Total
2 OR MORE YRS. ABOVE MENTAL AGE ACHIEVEMENT NORM.		2					2
1 TO 2 YEARS ABOVE MENTAL AGE ACHIEVEMENT NORM.	2	2	4	1			9
0 TO 1 YEAR ABOVE MENTAL AGE ACHIEVEMENT NORM.		4	17	23	6		50
AT MENTAL AGE ACHIEVEMENT NORM.		3	12	9	9		33
0 TO 1 YEAR BELOW MENTAL AGE ACHIEVEMENT NORM.	4	4	30	75	74	15	202
1 TO 2 YEARS BELOW MENTAL AGE ACHIEVEMENT NORM.	1	5	27	38	82	58	211
2 OR MORE YRS. BELOW MENTAL AGE ACHIEVEMENT NORM.			8	5	23	48	84
	7	20	98	151	194	121	591

may be readily derived from the class record cards, as has been done on Plates 42b, 43b, 44b and 45b for the data on Plates 42, 43, 44 and 45. Such quantitative expressions are even essential for quantitative comparisons. Of the 658 girls present for the spelling test in school system C, 99 had mental ages below the fifth-grade norm and 115 had mental ages above the seventh-grade norm for the end of the grade. That 21 of the less gifted girls—more than a fifth of them—should be making higher records in spelling than 18 of the 115 superior girls is striking. Yet the data in the thought phase of geography for these same girls (Plate 44b) is quite as striking. Furthermore, while nearly four fifths of the more gifted girls are above the sixth-grade achievement norm in spelling, only about one half of them are above the sixth-grade achievement norm in the thought phase of geography. In the case of the 114 boys of the same mental ages (Plate 45b) 71 or approximately three out of five surpass the sixth-grade norm.

That 29 of the boys with fourth-grade to fifth-grade mental ages should be making between fourth-grade and fifth-grade achievement scores in the thought phase of geography (Plate 45b) is not surprising but that 87 of the 195 boys with fifth-grade to sixth-grade mental ages, 66 of the 193 boys with sixth-grade to seventh-grade mental ages, 11 of the 71 boys with seventh-grade to eighth-grade mental ages, and one of the 43 boys with mental ages higher than the eighth-grade norm should make similar achievement scores is striking enough to call for supervisory attention. That 16 of the 193 boys (Plate 45b) with sixth-grade to seventh-grade mental ages have achievement scores below the fourth-grade norm while five more boys of similar mental ages have from seventh-grade to eighth-grade achievement scores is equally significant to the supervisor of geography.

In the case of spelling the summaries in the bottom half of Plates 42b and 43b reveal a tendency of no small concern to the supervisor. While 35 of the girls are two or more years above their mental-age achievement norms only 21 boys are above their achievement norms to the same extent even though the total number of boys is nearly as large as the total number of girls. As compared with 50 boys, 110 girls are from one to two years above their mental-age norms. Also, while 80 boys are from one to two years below their mental-age norms only 45 girls make so poor a showing. Among both the girls and boys some of those making lower than sixth-grade achievement norms are more than a year in advance of the mental-age norms. Likewise some who are making better than seventh-grade achievement scores are more than a year below their mental-age norms.

In Quality of Work Schools in the Same System May Differ Markedly from One Another. In Table 1 are given the mid[1] achievement quotients of the sixth-grade boys and girls separately for each phase of instruction for ten of the forty-five schools measured. At the left of the table are given the numbers of pupils in the classes and the mid intelligence quotients. In the third column from the right are given the arithmetic means of all the mid achievement quotients for each class. The mid achievement quotients were used for the individual groups to eliminate the distorting effect of any large variation in the case of a single pupil. The arithmetic means of the mid measures were used to include the amount of variations among the mid measures and also to offset the differences in the proportions of girls and boys in the different classes. In recording the arithmetic means all fractions have been dropped. The variations of the arithmetic means for each class from that for the school system as a whole are given in the second column from the right. In the last column are the mid mental ages for each class. It is interesting to note that the school (No. 10) with the largest number of sixth-grade pupils, the highest intelligence quotients and the highest mid mental age is one of the two schools in this group having the lowest achievement quotients. School No. 3, however, is third from the top in size of achievement quotients even though it has nearly as many pupils as school No. 10 and also has high intelligence quotients and high mental ages. While the class smallest in size, No. 1, and with intelligence quotients below the average and with a mid mental age next to the lowest, has the highest achievement quotients, school No. 8 with a class but little larger, with considerably lower intelligence quotients and with the lowest mid mental age, stands third from the bottom in size

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[1] The mid achievement quotient, like a mid score or a class score, is the middle one of the achievement quotients for a group when they are arranged in order from the smallest to the largest.

TABLE 1.

MID ACHIEVEMENT QUOTIENTS OF TEN SCHOOLS OF SCHOOL SYSTEM C.

		No. of Pupils	I.Q.	Spelling	Reading	History Information	History Thought	Geography Information	Geography Thought	Arithmetic Fundamentals	Arithmetic Problems	Average A.Q.	Variation from Average A.Q. for all Schools	Mid Mental Age
1.	B	6	97	111	98	83	104	95	97	117	90			
	G	9	99	110	96	71	100	94	96	109	86	97	+5	11– 8
2.	B	13	101	107	93	79	103	96	92	102	112			
	G	10	106	109	96	73	100	87	95	105	113	97	+5	12– 8
3.	B	16	111	95	96	80	99	94	91	106	99			
	G	28	104	101	99	73	92	90	88	110	95	94	+2	12–10
4.	B	10	92	100	93	77	101	89	94	103	91			
	G	17	98	109	108	75	107	84	94	98	82	94	+2	11–10
5.	B	20	109	102	96	77	102	95	93	93	86			
	G	14	115	92	102	74	98	85	91	99	87	92		13– 0
6.	B	21	99	96	91	70	97	90	90	103	94			
	G	24	101	103	99	70	92	86	91	109	90	92		12– 1
7.	B	13	105	101	101	76	88	87	91	90	92			
	G	12	100	100	99	71	94	83	90	90	91	90	—2	12– 3
8.	B	11	91	106	87	77	90	91	91	93	92			
	G	11	92	110	96	73	92	80	92	88	83	90	—2	11– 6
9.	B	18	97	97	91	71	89	91	92	96	85			
	G	15	94	103	97	67	89	76	94	98	83	88	—4	12– 4
10.	B	20	122	94	91	75	92	89	86	90	86			
	G	30	117	92	96	73	93	89	85	95	85	88	—4	13–11
All Schools	B	629	101	99	96	75	94	90	91	98	93			
	G	670	101	103	98	72	92	86	90	102	90	92		12– 5

of achievement quotients even though in spelling it is near the top. Neither the size of the class, the size of the intelligence quotients nor the size of the mid mental age, nor even the size of all three factors combined seems to be an important element in determining the size of the achievement quotients of a sixth-grade class.

These ten cases represent the extremes as well as the typical sixth-grade classes in the school system. In mid intelligence quotients they vary from 91 to 119, a wide variation even for individual pupils. In mid mental ages they vary from 11 years 6 months to 13 years 11 months, a difference of nearly two and a half grades. In average achievement quotients they vary from 88 to 97. This variation is somewhat exceeded in spelling, in which school No. 1 has a mid achievement quotient of 110 while school No. 10 has one of 93. The variations in mid achievement quotients from 90 to 112 in the fundamental operations of arithmetic and from 84 to 112 in arithmetic problems are indicative of wide differences from class to class. In general, spelling and the fundamental operations of arithmetic seem to have received the most attention and the information phase of American history the least. The highest mid achievement quotient in the information phase of American history is lower than the lowest one in any other phase of instruction except the one for the girls in the information phase of geography in school No. 9.

Is a Very High Quality of Work in Some Phases of Instruction Accompanied by a Very Low Quality of Work in Other Phases? For an entire school system the answer may be "yes." For a school as well as a class there is a similar common impression. If an unusual quality of work is done in some phase of instruction we expect a correspondingly poor quality of work in some other phase and vice versa. This general impression, however, seems to be far from the truth. On Plate 46 the quality of work of each school is pictured to show its relation to the system as a whole. In case a class achievement quotient in a subject is more than four points above the mid achievement quotient for the entire school system in that subject this fact is denoted by a ‡ after the number of the school and under the name of the subject. A + indicates that the class achievement quotient is more than two points but less than four points above that for the school

PLATE 46

Comparative Quality of Work of the Sixth Grade Classes in the 45 Schools of a Large School System.

School	Median I.Q	Reading	Spelling	Arithmetic Fundamentals	Arithmetic Problems	History Thought	Geography Thought	Geography Information	History Information
19	95	‡	‡	-	‡	‡	‡	‡	‡
18	98		‡	‡	-	‡	‡	‡	‡
29	103	-	‡	+	‡	‡	+	+	+
9	91	‡		‡		‡		‡	
32	97				‡		‡	‡	+
28	108		-	‡	‡	+		+	+
13	104				+	+	+	+	‡
33	95		‡	‡	‡			=	‡
2	99					‡	‡	‡	
45	101	‡	‡	-	+	+			
38	95	+	+		=	‡	+		+
11	103			-	‡				‡
6	107	‡							
39	106		‡						
1	112		+	-	=	‡			
15	94		+						
26	102		=	‡		+	+		-
31	108			+					
36	100			‡					
41	103			+	+	+			=
43	98	=	‡			+			
30	96			=	‡				
44	96	=	‡	=	‡				
3	102	+		=				-	
4	109	‡		-	=	=	+		-
8	98	-		-	+				
20	93	‡	‡	=	-	-		-	
23	111			=			-		‡
14	102		=	=		+	+		
21	104		+	‡		=	-	=	
25	86	-	=	+	‡		=	=	‡
27	104	=							
7	103	-		‡		-	=		-
35	99			+	=	-	+	-	-
5	102	=		-					
12	91	=	‡	=	-			-	
24	105		+	-	=		-		
10	90	+	=	=	=	-			
17	103	+		-	=	-		-	-
22	98			+		=		=	=
34	95	-		-	=	-	+	=	+
42	100	=				-			=
16	92		-	=		=		-	
37	99	+	-			=	=	=	
40	119	-	=	=	=		=		

system. In the same way a — shows that the class achievement quotient is more than two points but less than four below that for the school system, while a = indicates that it is more than four points below. When it is only two points or less on either side the mid achievement quotient of the school system no designation other than a blank space is used.

An examination of the plate shows that schools differ in quality of work from one phase of instruction to another just as the school system as a whole differs. The amount of the variation is not great except in a few cases. In the top quarter of the Plate, for example, where there are 36 ‡'s, there are only two ='s. In the bottom quarter there are 24 ='s but only one ‡. Even in the middle fifty per cent of the schools there are only five cases out of the 23 where there is a single = when there are as many as two ‡'s, or of a single ‡ when there are two ='s. Of the seven schools that have three or more ‡'s only one school has even one =. Only one of the five schools with three or more ='s has one or more ‡'s. In this school system at least a very poor quality of work in certain subjects in comparison with that of the system as a whole, cannot be explained on the basis of exceptional work in some other subjects. The school that stands very low in a few phases of instruction is not likely to stand very high in any phase. Likewise the school that stands high in a few aspects of instruction is unlikely to stand very low in any phase.

CHAPTER VIII

SUMMARIZING EDUCATIONAL MEASUREMENTS

Although the most important use that can be made of educational measurements, at least from a supervisory point of view, is an analytical and diagnostic one, there are many instances when a summary of measurements is invaluable. Any quantitative comparison of the achievements of different classes, of different schools or of different school systems involves the determination of some representative measures of achievement. Likewise the quantitative comparison of class measures with grade standards or with mental-age norms requires the finding of representative class measures of achievement. Even grade standards or mental-age norms are but a special form of summary. They express in a single representative measure the achievement of a widely scattered group working under similar instructional conditions or else bearing the same group label.

Both Grade Standards and Mental Age Norms Are Commonly Expressed as Median Scores. The median score, of course, is the point in the series of scores on either side of which half of the cases lie. It is accurately expressed in a fractional form, as 74.8. To find it the scores are arranged in a frequency table like those in Plates 1, 2 and 3. After each score is written the number of pupils in the group making it. Starting at either end of the frequency column, the frequencies are added until just exactly half of the cases have been used. This point usually falls within a score step. In such an instance the cases within the step are considered as distributed along at equal intervals throughout that score. Thus, if there are one hundred cases and 46 of them have been added before the midpoint has been reached but at the next score, 74, there are 5 cases, the median would be 4/5 of the way through the step 74, or would be 74.8.

When the smallest unit that a pupil can add to his score is *one* the .8 has little significance for he must either always fall short of or else surpass the median score. A pupil's score, however, means that he reaches at least that point but may just fail of attaining the next higher score, hence he may actually attain the median score even though his expressed score, being a whole number, falls short of it. In view of this condition and also of the fact that individual scores usually have a probable error greater than the largest fractional part of a score step, the dropping of all fractions seems advisable in the case of norms with which individual or even class scores are to be compared. When the fraction is thus dropped from a median score the score becomes a mid score like a class score, and has the same meaning as a class score; it is the score step within which the middle case falls when the scores are arranged in order from the smallest to the largest. Only in very detailed experimental work where many measurements of the same function are averaged for individuals or where a very large number of cases is employed is the use of the accurate median advisable. In all other instances the fractional part is likely to give an impression of greater reliability than the facts warrant.

The Derivation of the Achievement Norms for the Educational Scales Was Based on Their Use in the Elementary School and the Junior High School. On the basis of some 1200 cases approximately equally distributed between the girls and boys as well as among each of the six half grades above the fifth grade in elementary schools scattered over a fairly wide territory, the grade standards and mental-age norms for the educational scales were derived. At least one form of each mental test or educational scale referred to in the present series was given to each of the 1200 pupils. These norms as given on the Individual Record Card A, on the Sheet of Norms for finding the mental-age and grade variations, on the Age and Quotient Chart for finding the mental and achievement quotients, and on the Distribution Sheet, represent present educational practices as far as achievement attainments and distribution of emphasis among the various phases of instruction is concerned. That these norms fairly well represent current practice is evidenced by the fact that classes and even whole grades throughout a school system are frequently found to conform very closely to the norms, and also by the distribution of class scores above and below the norms in approximately equal numbers where the various phases of instruction have been consistently taught throughout the grades. Any significant variation from these norms thus represents a departure from current practice. Such a departure when found throughout a school system and inevitable as a result of the course of study in use may be entirely justified. Nevertheless it is important to know just how great the departure is and to discover what compensations for it there may be. Where wide variations are found from school to school, however, such a condition is very likely to represent a lack of quantitative acquaintance with the achievements of the schools rather than planned adjustment.

The Achievements of Different School Systems May Be Analyzed and Compared on the Basis of Mid Scores and Percentile Scores. A comparison of the mid scores for school system C in Table 2 with the sixth-grade norms in the last column shows that the mid scores for the boys are below the norms in all phases of school work except the fundamental operations of arithmetic, while those of the girls reach the sixth-grade norms in spelling and the fundamental operations of arithmetic only. In reading, both the girls and boys are half a year below the sixth-grade norm, while in the information phase of both American history and geography as well as in the thought phase of geography they are a year below. Even in the thought phase of American history and arithmetic the girls are a full year below, while the boys are at least half a year below. The lowest pupils among those in the top quarter of the grade in achievement are a year in advance of the mid pupils, yet in spelling, reading and the fundamental operations of arithmetic only do these superior pupils reach or approximate the seventh-grade norms. In the information phase of American history they fail to reach even the fourth-grade norm.

Just as the mentally youngest pupils in the upper quarter of the sixth grade in mental age are eight months older mentally than the mid pupils, so the mentally most mature pupils in the lower quarter are eight months younger mentally than the mid pupils. Thus in mental age the middle fifty per cent cover a range of a grade and a third. The highest pupils among those in the lower quarter in achievement are approximately a year

TABLE 2.

Scores in Each Scale for the Sixth Grade of School System C.

No. of Cases		Grade Scale	25 Percentile Scores		Mid Scores		75 Per-Centile Scores		Sixth Grade Norms
Boys	Girls		Boys	Girls	Boys	Girls	Boys	Girls	
621	658	Spelling *	49	50	51	52	55	56	52
613	623	Reading *	44	44	48	48	53	55	50
578	583	History Information	50	48	56	53	61	57	74
575	605	History Thought	64	60	70	68	76	74	74
598	626	Geography Information	61	57	68	63	74	70	74
591	624	Geography Thought	63	62	68	66	74	70	74
560	601	Arithmetic Fundamentals	67	67	74	74	80	81	74
565	601	Arithmetic Problems	56	52	63	59	70	67	66
		Mental Ages	11–10	11–8	12–7	12–4	13–3	13–0	12–6
		Intelligence Quotients	92	92	101	101	112	111	100

* In spelling and reading 4 points are equivalent to a year's work in school. In the other phases of school work 6 points are equivalent to a year's achievement.

below the mid pupils except in spelling, where they are only half a year below. Likewise the lowest pupils in the upper quarter in achievement are approximately a year in advance of the mid pupils in the same grade in all phases of school work. In every phase of achievement measured except spelling, the range of the middle fifty per cent of these sixth-grade pupils is as wide as from the normal achievement of fifth-grade pupils to the normal achievement of seventh-grade pupils. In many phases of instruction—in reading, in the thought phase of American history, geography and arithmetic, and in the fundamental operations of arithmetic—the achievement of the highest pupils in the lower quarter fell below the fifth-grade standards. In the information phase of both American history and geography the achievement of both the girls and boys fell even below the norms for fourth-grade pupils, while that of the girls also failed to reach the achievement standard of fourth-grade pupils in the thought phase of American history and arithmetic.

In the same way the 25 percentile scores, the mid scores and 75 percentile scores for the sixth, seventh and eighth grades of school system B in Table 3 may be compared with the sixth-grade, seventh-grade and eighth-grade norms at the left of the table The sixth grade mid score in the fourth column is four points or a year below the sixth-grade norm in spelling, 15 points or two and a half years below in the information phase of American history, and half a year or more below in reading, the thought phase of history, the information phase of geography and arithmetic problems. In the fundamental operations of arithmetic alone is the sixth-grade standard surpassed by the mid pupil. The seventh grade, although three months below the normal mental age of seventh-grade pupils, either surpasses or very neartly attains all the seventh-grade standards except those in the information and thought phases of geography, in which it is approximately a year below the norms. The eighth grade is below the eighth-grade norms in all subjects except arithmetic problems. Nor should it be expected to make a notably different showing, as it is four months below the normal mental age of eighth-grade pupils at the end of the year and has studied neither American history nor geography during the preceding year. The pupils in the seventh and eighth grades have evidently been promoted more rapidly than is usually done as the mental ages are lower while the intelligence quotients are higher than the norms. This may be a favorable indication that the superior pupils in these grades have been more rapidly promoted than is usually the case. The seventh grade is evidently a superior group of children as the 25 percentile intelligence quotient is 99 while both the mid intelligence quotient and the 75 percentile intelligence quotient are higher than are commonly found.

With relatively few exceptions the best pupils in the lower quarter in achievement are approximately a year below the mid pupils while the lowest pupils in the top quarter in achievement are a year in advance of the mid pupils. This tendency holds true in the sixth, seventh, and eighth grades alike in school system B just as it held for the sixth grade of school system C. The pupils in the upper quarter of the seventh grade all make scores

TABLE 3.

Scores in Each Scale for Each Grade of School System B.

	25 Percentile Scores			Mid Scores			75 Percentile Scores			Grade Norms		
Grade Scale	6A	7A	8A	6A	7A	8A	6A	7A	8A	6A	7A	8A
Spelling	45	50	53	48	55	58	52	59	62	52	56	60
Reading	42	50	52	48	55	55	54	59	61	50	54½	58½
History Information	53	70	64	59	76	69	66	81	75	74	80	86
History Thought	66	75	74	72	80	81	77	87	88	74	80	86
Geography Information	64	68	67	70	73	71	76	76	76	74	80	86
Geography Thought	67	68	69	72	72	74	77	77	78	74	80	86
Arithmetic Fundamentals	70	77	77	76	82	83	84	87	87	74	80	86
Arithmetic Problems	56	66	69	61	71	80	67	77	86	66	72	78
Mental Ages	11–10	12–10	13–4	12–6	13–3	14–2	13–2	14–2	14–11	12–6	13–6	14–6
Intelligence Quotients	91	99	93	101	105	104	110	114	110	..	..	..

higher than the mid scores of the eighth-grade pupils except in arithmetic problems. At the same time the mid scores of the seventh-grade pupils are higher than the scores of the best pupils in achievement in the lower quarter of the eighth grade. This is due in part, however, to the dropping of the content subjects of history and geography at the end of the seventh grade, for the 75 percentile scores of the seventh grade surpass the 75 percentile scores of the eighth grade in range of information in American history, equal them in range of information in geography and in the fundamental operations of arithmetic and nearly equal them in the thought phase of both history and geography. The mid scores of the sixth-grade pupils differ but slightly in most cases from those of the best pupils in achievement in the lower quarter of the seventh grade and would differ still less were they not four months younger mentally. In geography the sixth-grade mid scores are even higher. The 75 percentile scores of the sixth-grade pupils likewise closely resemble the seventh-grade mid scores, even surpassing them in geography and the fundamental operations of arithmetic.

A comparison of the scores for school system B with those of the larger school system C (Tables 2 and 3) shows that in spelling the pupils of the larger system are approximately a year in advance of the pupils of the smaller system B. In reading and arithmetic problems the differences are slight. In all other phases of school work the sixth-grade pupils of the smaller system are approximately half a year in advance of those of the larger system. Yet the difference in the case of the 25 percentile mental ages, the mid mental ages or the 75 percentile mental ages of the sixth-grade pupils in the two school systems is very slight. The sixth-grade mid scores for school system A (Table 4) surpass those of the same grade in the large school system C by a still greater amount. Although only about a quarter of a year ahead in mental age, school system A is in advance of school system C in American history by a half year, in spelling, geography and the fundamental operations of arithmetic by approximately a year and in the arithmetic problems by more than a year and a half.

A similar comparison of the sixth-grade scores of school system A (Table 4) with those of the pupils of the same grade in school system B, the other small city system (Table 3) shows that school system A surpasses school system B in mental age by about three months, in achievement in spelling by approximately two years, in arithmetic problems by a year and a half and in geography and the fundamental operations of arithmetic by approximately half a year. It equals school system B in American history and falls below it in reading by half a year or more. Significant as these differences are those in the case of the seventh grade are even more so. Although the seventh grade of school system A surpasses that of school system B in mental ages by only about a

TABLE 4

Scores in Each Scale for Each Grade of School System A.

	25 Percentile Scores			Mid Scores			75 Percentile Scores			Grade Norms		
Grade Scale	6A	7A	8A	6A	7A	8A	6A	7A	8A	6A	7A	8A
Spelling	51.5	57	64	58.5	60.5	66.5	63	63.5	70	52	56	60
Reading	46	55	58	51	58	64	56	64	69	50	54½	58½
History Information	53	71	78	58	76	83	62	79	88	74	80	86
History Thought	66	81	90	74	84	94	79	88	100	74	80	86
Geography Information	67	84	77	75	89	81	81	95	85	74	80	86
Geography Thought	68	77	77	74	84	80	81	92	84	74	80	86
Arithmetic Fundamentals	77	83	84	81	87	88	86	95	96	74	80	86
Arithmetic Problems	65	74	85	70	82	92	80	88	100	66	72	78
Mental Ages	12–2	13–0	14–6	12–8	13–7	15–3	13–6	14–4	16–2	12–6	13–6	14–6
Intelligence Quotients	102	98	104	108	107	110	114	115	118	..	..	..

quarter of a year, it surpasses the latter in achievement in spelling, reading and the fundamental operations of arithmetic by fully a year, in arithmetic problems by nearly two years and in geography by more than two years. In American history alone is it making approximately the same achievement scores. In the eighth grade the course of study differs so widely in the two systems that a comparison would lack significance except in showing that school system A surpasses school system B by slightly more than a year in mental age and in the fundamental operations of arithmetic, from a year to a year and a half in geography, by two years in spelling and reading and by more than two years in American history and arithmetic problems. Whether or not such wide variations in achievement from one school system to another are advisable, it is of great importance to know that they exist. Certainly pupils cannot transfer from the one school system to the other without serious misadjustments.

With the exception of the information phase of American history and geography and the thought phase of history even the lowest pupils in achievement in the upper quarter of the sixth grade of school system A surpass the highest scoring pupils in the lower quarter of the seventh grade. Though these sixth-grade pupils are chronologically younger they are mentally more mature. This in part accounts for their superiority in achievement in spite of their lower grade location. In the same way all the pupils in the seventh grade making achievement scores that lie in the upper quarters of the distributions surpass the highest scoring pupils in the lower quarter of the eighth grade except in the thought phase of American history. And in this case the lowest mental age of the superior quarter of the seventh grade is lower than the highest mental age of the lower standing section of the eighth grade.

In making comparisons from the data in such tables as these certain features need to be kept in mind. The comparisons are between scores rather than amounts of abilities. In the case of the tests used as the basis of these tables the range of the abilities is only about one tenth less than the range of the scores. Then, too, it should not be overlooked that the mentally more mature pupils are not invariably found in the top quarter of a grade in achievement nor the mentally immature in the lowest group in achievement. Nor do the same pupils stand in the lower or the upper quarters in all phases of achievement. To offset these tendencies, however, the 25 percentile and 75 percentile mental ages and scores represent only the very highest and the very lowest mental ages and scores of the respective sections. The intercomparisons of mid scores from school to school or from school system to school system as well as with achievement norms are not affected by these tendencies that make for a lack of preciseness in making intercomparisons of percentile and mid scores within the same table. While comparisons of mid scores render the tables of most value, nevertheless the intercomparisons are suggestive of some facts that might otherwise be overlooked in examining the measurements of a school system.

For Measuring the Quality of Work of a School or a School System Mid Achievement Quotients Are Convenient Devices. With the use of an Age and Quotient Chart the achievement quotients are simple to find. In expressing the relation of what a pupil knows or can do to what the average pupil of his mental age knows or can do, they are also consistent and definite in meaning. They are even more valuable for comparing the quality of work of classes, of special groups of pupils, of schools and of school systems than they are for comparing the quality of work of individual pupils. The mid achievement quotients are not only more reliable than individual achievement quotients but they are less subject to special instructional conditions within a group or else they are directly indicative of such special instructional conditions as the teaching of some elements of a subject in one grade and other elements of it in the succeeding grade. This very frequently happens in the teaching of arithmetic. When pupils with high mental ages are discovered making low achievement quotients in a grade far below their capacity to achieve, this should be taken as a criticism of their grade placement rather than of the achievement quotient as a device. It does not then, of course, indicate the pupil's quality of effort alone but also the condition that may be responsible for it.

A table giving mid achievement quotients may be used to contrast the quality of work of the girls and boys in a school system as well as to compare that of successive grades. The data in Table 5 give a basis for making these comparisons for school system B. It is clear from the mid achievement quotients for the sixth grade that in both ranges of information in history and geography and in the thought phase of arithmetic as well as of these subjects, the boys surpass the girls in quality of work by from five to nine points. In spelling alone do the girls significantly surpass the boys. In the seventh grade the boys surpass the girls in quality of work in the information and thought phases of American history, in the thought phase of geography and in arithmetic problems, but to a lesser degree than in the sixth grade. In the other phases of instruction the seventh-grade girls

TABLE 5.

MID ACHIEVEMENT QUOTIENTS IN EACH SCALE FOR EACH GRADE IN SCHOOL SYSTEM B.

	Spelling	Reading	History Information	History Thought	Geography Information	Geography Thought	Arithmetic Fundamentals	Arithmetic Problems	Average
6A									
Boys	89	98	83	99	100	100	103	94	95
Girls	94	97	78	93	91	93	103	88	92
All	91	97	79	97	94	97	103	91	93
7A									
Boys	91	99	96	102	92	91	102	102	97
Girls	102	101	93	98	92	89	104	97	97
All	98	101	94	100	92	90	103	99	97
8A									
Boys	93	98	84	98	85	89	97	106	93
Girls	99	97	79	93	82	85	98	103	92
All	96	97	81	95	84	87	97	104	92

either do as well as the boys or surpass them. The averages of the mid achievement quotients for the girls and boys are the same. The eighth-grade boys surpass the girls in both the information and thought phases of instruction but also to a lesser degree than in the sixth grade. The amount by which the girls surpass the boys in spelling partially evens up the averages of the mid achievement quotients. The seventh grade surpasses the sixth grade and eighth grade in spelling, reading and both phases of American history; ties for the leading place in the fundamental operations of arithmetic with the sixth grade; but falls below the sixth grade in the information and thought phases of geography as well as below the eighth grade in arithmetic problems. In spite of its superiority over the other two grades the seventh grade makes an average achievement quotient slightly below the norm of 100. The average achievement quotients of the sixth and eighth grades indicate a quality of work nearly a year below the average.

Mid achievement quotients are effective devices for comparing the quality of work of different schools within a system. Those given for the sixth and seventh grades of school system A in Table 6 show some marked differences in quality of work and also in emphasis. In the sixth grade, school I shows marked emphasis upon geography and the thought phase of arithmetic; school II is evidently emphasizing spelling and the fundamental

TABLE 6.

MID ACHIEVEMENT QUOTIENTS FOR EACH GRADE IN EACH SCHOOL OF SYSTEM A.

	Spelling	Reading	History Information	History Thought	Geography Information	Geography Thought	Arithmetic Fundamentals	Arithmetic Problems	Averages
Grade 6A									
School I	101	100	78	100	110	108	104	110	101
School II	118	101	78	99	97	95	113	97	99
School III	102	98	71	93	84	90	107	91	92
All Classes	107	100	76	96	98	98	108	99	97
Grade 7A									
School I	107	105	95	104	113	112	111	110	107
School II	104	103	92	99	103	95	105	104	101
All Classes	106	104	93	102	106	102	110	107	103
Grade 8A									
Boys	104	100	90	103	91	87	94	108	97
Girls	109	103	92	104	88	88	99	106	98
All	107	102	91	104	89	88	98	107	98

operations of arithmetic all out of proportion to the other phases of instruction. In reading and American history the two schools are doing a similar quality of work but in arithmetic they are emphasizing different aspects of the subject. Despite the marked differences in the distribution of emphasis the averages of the mid achievement quotients are similar for schools I and II. For school III it is decidedly lower, however. In every phase of instruction except spelling, reading and the fundamental operations of arithmetic the mid achievement quotient is significantly lower than in either of the other two schools. Even in these subjects it is lower than in one or both of the other schools. There can be little question but that school III is doing an inferior quality of work in most phases of instruction while all three schools are neglecting the information phase of American history. As the pupils from school III go to either school I or II for their seventh-grade work they evidently enter upon it with serious handicaps.

In the seventh grade, school I surpasses school II in every phase of instruction as well as in the average of the mid achievement quotients. School I falls significantly below the average of 100 in the information phase of American history alone. In all other phases it is significantly above the average even though the pupils are mentally overage for the seventh grade. The mid achievement quotients are significantly below the average in school II only in the information phase of history and the thought phase of geography. For the eighth-grade work the pupils all attend the same school, so the mid achievement quotients have been found for the boys and girls separately. Just as in the eighth grade of school system B, the girls surpass the boys in quality of work in spelling and in the fundamental operations of arithmetic but they also surpass the boys in reading, in both phases of American history and in the thought phase of geography as well. Even in the information phase of geography and in arithmetic problems the boys surpass the girls but slightly in the eighth grade of school system A.

A comparison of the mid achievement quotients for all pupils in the sixth-, seventh-, and eighth-grade classes in school systems A and B reveals some striking differences. In each phase of instruction except American history the sixth grade of school system A surpasses that of school system B in quality of work. The seventh grade of school system A surpasses that of school system B in quality of work in every phase of instruction except the information phase of American history. The eighth grade of school system A, despite the fact that the mental ages of the pupils are a year higher than in the eighth grade of school system B, surpasses it in every phase of instruction.

Do Smaller City School Systems Do a Poorer or Better Quality of Work Than Large School Systems? In spelling (Table 7) one of the two smaller city systems, school system B, falls surprisingly below the large city school system C in quality of work in the sixth grade. In reading and arithmetic problems a similar quality of work is being attained as in the large city schools. But in both the information and thought phases of both American history and geography as well as in the fundamental operations of arithmetic a distinctly superior quality of work is being achieved in the smaller city school system B. A still more striking contrast is apparent on comparing the mid achievement quotients for school system A with those of school system C. Without a single exception the mid achievement quotients are from three to ten points higher in the smaller city school system. Nor can the better quality of work of the smaller cities be ascribed to a greater emphasis upon the mechanical phases of instruction; the superiority is as great in the thought phases of instruction as in the information phases and in the content subjects as in the tool subjects.

TABLE 7.

MID ACHIEVEMENT QUOTIENTS OF THE SIXTH GRADE IN SCHOOL SYSTEMS C, B AND A.

		Spelling	Reading	History Information	History Thought	Geography Information	Geography Thought	Arithmetic Fundamentals	Arithmetic Problems	Averages of the Mid A.Q.'s
School	C	101	97	73	92	88	90	99	91	92
System	B	91	97	79	97	94	97	103	91	93
	A	107	100	76	96	98	98	108	99	97

For Measuring the Achievement of the Previous Year the Mid Measures of the Gains Made by the Pupils Is an Efficient as Well as Simple Method. For this end the educational scales are especially adapted. As they possess approximately equal units of measurement throughout their length gains made in one class or grade may be compared with those made in other classes or grades. The further fact that their structure is based upon the variability of a grade or mental age group in each phase of instruction and that the variability in terms of scale scores does not differ markedly either from subject to subject or from grade to grade makes it feasible to compare gains from one phase of instruction to another. Pupils of average capacity, working under average instructional conditions, with an average distribution of emphasis from one phase of instruction to another in the class achieve a gain of six C-scale[1] points or four T-scale points during a year's work in school.

From the data on Permanent Individual Record Cards like those illustrated on Plates 14 and 15, the gains in achievement for each pupil may be readily calculated by subtracting the first series of scores from the subsequent series of scores. For example, the gains made by Margaret L on Plate 15, are 6½[2] points in spelling, 7½[2] in reading, 2 in range of information in American history, 11½ in the thought phase, 7½ in the information phase of geography, 5½ in the thought phase. In arithmetic problems there is a loss of 1 point. This gives an average gain of 5.6 points for Margaret. But as her intelligence quotient is 115 she should be expected to gain 1.15 times 6 points or 6.9 points instead of 5.6 points. From such individual gains the mid gain for a class or a grade can be readily found.

How widely two schools in the same small city are likely to differ in mid gains is shown in Table 8. With the exception of the information phase of geography the gains in school J are all below six points, the average of the mid gains being just five scale points. In school K, however, very large gains are made in both phases of geography and in the thought phase of arithmetic with a very small gain in spelling. The fact that the average gain for school K is more than fifty per cent greater than for school J is of great significance. Such a gain may be due to differences in

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[1] The Posey-Van Wagenen Geography Scales and the Van Wagenen American History Scales are examples of the C-score scales. The Thorndike-McCall reading Scales and the Morrison-McCall Spelling Scales are examples of the T score scales.

[2] In spelling and reading the actual gains should be multiplied by 1½ as the scale units are 1½ times the size of the scale units in the other scales.

TABLE 8.

MID MEASURES OF GAINS MADE IN THE SEVENTH GRADE OF SCHOOLS J AND K OF SCHOOL SYSTEM A AND ALSO IN THE SEVENTH GRADE OF BOTH SCHOOLS.

Schools	J	K	All
Spelling	+ 4½ *	+ 1½ *	+ 3 *
Reading	+ 3 *	+ 4½ *	+ 4½ *
History Information	+ 4	+ 5	+ 5
History Thought	+ 5	+ 5	+ 5
Geography Information	+ 11	+ 15	+ 12
Geography Thought	+ 5	+ 16	+ 9
Arithmetic Problems	+ 5	+ 10	+ 6
Average Gains	+ 5.0	+ 7.8	+ 6.3

* In spelling and reading a gain of 4 points is equivalent to a year's work in school. In the other phases of school work 6 points are equivalent to a year's achievement.

the pupils' normal rates of achievement as indicated by their intelligence quotients. But this was not the condition responsible in this case. It may have been due to more effective methods of teaching, to more efficient methods of studying on the part of the pupils, to better habits of attacking their work, to more stimulating incentives or to a more wholesome home environment.

In the same way that gains in various classes in the same grade may be summarized and compared, the gains made in the various phases of school work may be organized for several entire grades throughout the system, as has been done for the sixth, seventh and eighth grades in school system A (Table 9). Throughout this small city school system unusually large gains were made in spelling, in the information phase of American history and in arithmetic problems. The same large amount of gain was main-

TABLE 9.

MID MEASURES OF GAINS MADE BY THE PUPILS OF GRADES 6, 7, AND 8 IN SCHOOL SYSTEM A.

Grades	6	7	8
Spelling	+ 12 *	+ 3 *	+ 6 *
Reading	+ 3 *	+ 4½ *	+ 6 *
History Information	+	+ 5	+ 8
History Thought	+	+ 5	+ 8
Geography Information	+ 12	+ 12	0
Geography Thought	+ 6	+ 9	0
Arithmetic Problems	+ 13	+ 6	+ 4
Average Gain	+ 6.5	+ 6.3	+ 4.5

* In spelling and reading a gain of 4 points is equivalent to a year's work in school. In the other phases of school work 6 points are equivalent to a year's achievement.

tained in the information phase of geography during the seventh grade and more than an average amount of gain was made in the thought phase of geography. Spelling was the only subject seriously neglected but the emphasis given to it in the sixth grade may justify its neglect in the seventh grade. That the study of geography was the center of attention in the seventh grade of this school system is evident from the greater gains made in this subject. In the eighth grade, however, where no attention was given to it no gains were made. Here attention was devoted to the study of American history, in which better than average work was done. The averages of the mid gains in achievement show that somewhat greater gains than normal were made in the sixth and seventh grades and considerably less than normal in the eighth grade. Whether greater gains are made in the long run by stressing geography in the seventh grade and American history in the eighth grade or giving somewhat equal emphasis to both subjects in both grades could be very easily determined for a school system.

The mid gains made during a year's work form an effective basis for comparing the achievement of the different schools in a system. The two schools whose seventh-grade, seventh-eighth-grade, and eighth-grade mid gains are given in Tables 10 and 11 possess some achievement features in common but differ markedly in others. In spelling all three upper grades in each school made a normal or very nearly normal amount of gain. The seventh

TABLE 10.

Mid Gains Made in the Seventh Grade, Seventh-Eighth Grade, and Eighth Grade Classes in School A from June of One Year to June of the Following Year.

Grade	7	7A–8B	8
Spelling	+ 6*	+ 6*	+ 4½*
Reading	+ 1½*	+ 7½*	0*
History Information	+ 8	+ 10	+ 10
History Thought	+ 6	+ 9	+ 4
Geography Information	+ 3	+ 1	+ 12
Geography Thought	— 1	+ 6	+ 10
Arithmetic Problems	+ 10	+ 5	+ 5
Average of Mid Gains	+ 4.8	+ 6.3	+ 6.5

* In spelling and reading a gain of 4 points is equivalent to a year's work in school. In the other phases of school work 6 points are equivalent to a year's achievement.

TABLE 11.

MID GAINS MADE IN THE SEVENTH GRADE, SEVENTH-EIGHTH GRADE, AND EIGHTH GRADE CLASSES IN SCHOOL B FROM JUNE OF ONE YEAR TO JUNE OF THE FOLLOWING YEAR.

Grade	7	7A–8B	8
Spelling	+ 6*	+ 6*	+ 6*
Reading	0*	+ 7½*	+ 7½*
History Information	+ 9	+ 7	+ 6
History Thought	+ 7	+ 4	+ 7
Geography Information	+ 4	0	0
Geography Thought	+ 1	+ 2	— 1
Arithmetic Problems	+ 11	+ 10	+ 8
Average of Mid Gains	+ 5.4	+ 5.2	+ 4.9

* In spelling and reading a gain of 4 points is equivalent to a year's work in school. In the other phases of school work 6 points are equivalent to a year's achievement.

grade in neither school made any significant gain in reading but the seventh-eighth grade in both schools made more than a normal gain. Yet in school A the eighth-grade class made no gain in reading while in school B it made better than a normal gain. In range of information in American history all three grades made a normal or exceptional amount of gain. The seventh-grade class made the marked gain in school B and the seventh-eighth-grade and eighth-grade classes made the very high mid gains in school A. Although there were fluctuations in the gains in the thought phase of American history from class to class in both schools, the average gain for the three classes was about normal for each school. The gains in geography in the eighth grade in the two schools are in marked contrast. In school A unusually large gains were made in both phases of geography. No gain was made in either phase in the eighth grade of school B. Large gains were made in arithmetic problems in all three classes in school B but only in the seventh-grade class in school A. In averages of the mid gains for the three classes, the two higher classes in school A surpass the seventh grade and also the normal gain of six scale points. Yet in school B just the opposite tendency is true. Although the gain of the seventh grade is below the normal amount it is higher than the mid gain in either of the two higher grades in school B.

CHAPTER IX

CLASSIFYING THE PUPILS IN A CITY ELEMENTARY SCHOOL

Of the many factors involved in the grouping of pupils for instructional purposes chronological age is by no means the most significant one, yet it is still the basic factor in many schools. Regularity of promotion is at present the common tendency in a large proportion of schools. And it is a regularity of promotion largely based upon similarity in chronological age. Only the exceptionally incapable pupils are left behind at promotion time. The superior and the gifted pupils are only occasionally recognized as instructional misfits and promoted more rapidly than the pupils of average attainment. The wide range of mental ages found in most classes—a range of even five years not being uncommon—is striking evidence of the potency of chronological age as a factor in the grouping of pupils. Occasionally we speak of the need for taking emotional and social factors into account, implying that these are closely related to chronological age. Yet we are not at all sure but that even these are more closely related to mental age than to chronological age. The more mentally mature children surely have more mature and complex play interests than do the less gifted children of the same chronological age.

Chronological Age Is Inadequate as the Basis of Classification and Promotion Even Though It May Be an Important Factor. So long as chronological age is accepted as the important principle of promotion the problem is a simple one. But disturbing factors soon become apparent. Pupils enter school at different chronological ages—some enter at six, some at seven, and some at eight. Where shall each be placed? If the older ones are assigned to the grade corresponding to their chronological age the teachers are very likely to point out that their lack of the skills and information taught in the earlier grades places a serious handicap on these pupils and also upon the classes which they enter.

More disconcerting still to the teachers is the variation in the quality of work of pupils of the same age. The teachers find some pupils who are so handicapped, and are such a handicap to the class in which their age would place them, by their lack of the skills and knowledge which are presumably taught in earlier grades that they question the advisability of promoting such pupils regularly. These problems have been easily met in many instances. The late entering pupil is either coached by the conscientious teacher or allowed to start in a lower grade and progress in a regular way until he completes his school career, a year or two later, however, than if he had entered school at six. The backward pupil is retained in a grade and supposedly given an opportunity to become better prepared for doing the work of the next grade. With some pupils this process of retardation is repeated several times.

In contrast to this procedure, occasionally a teacher has had the insight and courage to suggest that a pupil who seems to be doing unusually well be allowed to skip a grade. But few indeed were these cases before the first age-grade tables revealed the preponderance of retardation over acceleration in school classifications! The growing insistence during the last few years that the amount of acceleration should approximate that of retardation has thrust another problem in classification upon the school principal. Either there must be less repetition of grades, with its attendant wider variation of abilities in a grade, or else more pupils must be given double promotions with all the drawbacks of supposedly serious gaps in their education. At this stage the newly devised achievement tests began to show that many pupils in the lower grades already could answer not only the same questions as the average pupils in the upper grades but in some cases could answer questions that the average upper grade pupils failed upon. In a few cases where the experiment was tried, it was found that interchanging the better half of a grade with the poorer half of the next grade above made for just as good if not even a better grouping of the pupils for instructional purposes. More and more the principle of classification on the basis of chronological age has given way to a trial and error process of grade retention, promotion, and acceleration, without any well defined principles to replace the one in the process of being discarded. Nor is a single, simple principle like chronological age likely to be found. That chaotic conditions with respect to promotion at present prevail is obvious. That the present grade groupings, unsatisfactory as they may be, are better for instructional purposes than would be those based on chronological age alone, are too evident in every classroom to need comment. What is needed, of course, is some basis for obtaining still more homogeneous groupings of pupils for instruction in masses.

Mental Age Is a More Satisfactory Basis of Classification than Chronological Age. With the development of mental tests a new basis of pupil grouping has become available; namely, the mental age. As far as school classification is concerned the mental test measures a pupil's capacity to learn in general on the basis of what he has already learned in the common everyday exposures and interests outside the classroom as well as in it. When a pupil, measured by one of the mental tests, is found to have a mental age of 12 years 6 months, it means that, regardless of his chronological age, he can do the same proportion of out-of-school problems or tasks attempted as can be done by the average pupil of the chronological age of 12 years 6 months. If the tasks are simple ones he will do many—approximately the same number as the average boy or girl of 12 years 6 months. If the tasks are difficult ones he will, of course, do few of them, but again approximately the same number as the average boy or girl of 12 years 6 months.

To the extent that a pupil's mental age can be accurately determined and to the extent that it is a safe basis for an expectation of what a pupil should achieve in school, it may be used as one of the principles of classification. That it meets these requirements to a reasonable degree is obvious from the experimental work of Terman, Otis, Franzen and others. To use it exclusively, however, would make astonishing changes in our present grade groupings of pupils. If at the end of a school year the pupils in the upper grades of a school were to be regrouped on the basis of their mental ages so that the pupils between the mental ages of 11 and 12 were to be called sixth-grade pupils, those between the mental ages of 12 and 13 were to be called seventh-grade pupils, and those between the mental ages of 13 and 14 were to be called eighth-grade pupils, nearly two thirds would be placed in groups other than those in which they are usually placed.

The Intelligence Quotient or Rate of Achievement Is Also a Significant Factor in Classifying Pupils. Were we to group together all pupils of the same mental ages, we would not yet have homogeneous groups for instructional purposes. The pupils would vary widely in their rates of achievement. Out of a group of one hundred pupils between the mental ages of 12 and 13 we would find about 6 with intelligence quotients of 125 or above and about 6 with intelligence quotients of 75 or less. Since the intelligence quotient is found by dividing the pupil's mental age by his chronological age, it is obviously a measure of the rate of his increase in mental age. Hence the six pupils with intelligence quotients of 75 or less are making a gain in mental age of only nine months or less while the six pupils with intelligence quotients of 125 or above are making a gain of fifteen months or more. These very wide variations in the amount of gain in mental age as well as in rate of achievement in practically one pupil out of every eight and fairly wide variations—from less than ten months to fourteen months and over—in four pupils out of every ten, make it imperative to take this factor into account in any reasonable system of classification.

Quite as Important as a Basis of Classification Is the Attainment of the Pupils. In fact, this is the factor responsible for the early disturbances in the regularity of promotion by chronological age. It is also the factor at the basis of teachers' marks. How important it is will be evident from the records of a few pupils just completing the sixth grade who were given two group mental tests and a double series of achievement scales.

Sanford, with a mental age of 12 years 11 months and an intelligence quotient of 116, had the achievement record of an average pupil at the end of the fifth grade. Another boy, Robert, with a mental age of 13 years 2 months and an intelligence quotient of 111, had the achievement record of a typical seventh-grade pupil at the end of the year. Here, then, are two boys with approximately the same mental ages and similar intelligence quotients but differing in achievement by two full years. Of tasks which Robert can attempt with an expectation of getting one half of them right, Sanford can hope to get only one out of five correct. When attention is directed to this condition the previous achievement of the pupil begins to loom up as an important factor in classifying pupils into homogeneous groups for instruction. The proportion of pupils whose average level of attainment differs from the norm for all pupils of their mental age by at least a year is approximately three out of ten or twelve in a class of forty. Such variations as those of Elizabeth and Edward below occur more rarely; only two are likely to occur in a class of forty. But the amount of their variation makes their significance even greater. Elizabeth, with a mental age of 13 years and an intelligence quotient of 103, makes an average achievement record on the achievement scales just a grade and a half below her mental-age norm; that is, while she should be half way through the seventh grade, her achievement scale record is that of an average fifth-grade pupil at the end of the year. Edward, on the other hand, with a mental age of 12 years 10 months and an intelligence quotient of 101 has an average achievement record just a grade and a half in advance of the norm for his mental age. When these two pupils, completing the same grade in school at approximately the same mental age, are given such school tasks that Edward can do about half of them correctly, Elizabeth will be fortunate in getting even one right out of each eight she attempts.

The Quality of Work Also Needs to Be Taken into Consideration in Classifying Pupils. Quite as important as the actual achievement is the quality of work done, the kind of habits of work and methods of study that have been formed. Just as the intelligence quotient is an index of the rate of gain in mental age, so in another quotient called the educational quotient, we have an index of the rate of gain in achievement in comparison with the rate of gain in chronological age. When this educational quotient is the same as the pupil's intelligence quotient he may be considered to be doing an average quality of work. When his educational quotient is higher than his intelligence quotient his quality of work is, of course, above the average. A further ratio or quotient may be used to express the relation between a pupil's educational quotient and his intelligence quotient. The achievement quotient is such a ratio and is thus a measure of the pupil's quality of work. Just as the intelligence quotient is derived by dividing a pupil's mental age by his chronological age, so his achievement quotient may be obtained by dividing his educational age by his mental age. When the average amount of achievement is determined for all pupils of the same mental age, say 11, any pupil attaining that degree of achievement is considered to have attained an educational age of 11. If he has attained the achievement of the average among the mentally 12-year-olds, he is considered to have an educational age of 12. When a pupil with an educational age of 12 has a mental age of only 10, he would have an achievement quotient of 120. Of the first two pupils mentioned, Sanford has an average achievement quotient of 88, Robert one of 102. Of the last two pupils, Elizabeth has an achievement quotient of 84 and Edward one of 108. If the pupils are of the same mental age and have approximately the same intelligence quotient, it is obvious that Edward, in addition to being three full years ahead of Elizabeth in achievement, is also going to work very much more effectively than Elizabeth is likely to work. Thus, in seeking a proper grouping of pupils for instruction, at least four factors need to be taken into consideration: the pupil's mental age, his expected rate of gain in mental age as indicated by his intelligence quotient, his actual degree of achievement, and his achievement quotients, which indicate his quality of work or the rate at which he may be expected to gain in achievement in proportion to his mental age. Complex though these principles may seem when taken together, they are, nevertheless, readily applied.

What Is the Nature of the Classification of the Pupils in a City Elementary School? As an illustration of the practicability of using quantitative measurements to improve the grading in a city school with one class for each half grade, a classification has been worked out for the four higher classes—the lower and upper seventh-grade classes and the lower and upper eighth-grade classes, designated as 7B, 7A, 8B and 8A classes respectively. To show the changes in grade placements and the amount of improvement that can be effected by a reclassification based upon mental and educational measurements the present classification is pictured on Chart 1. The necessary data for the reclassification were obtained by giving the pupils in this school the Terman Group Test of Mental Ability, Form A, and also an educational scale in each phase of the work of the school except English composition and handwriting. After the mental ages, intelligence quotients and scale scores had been determined and entered on the permanent individual record cards, the grade variations were determined for each pupil in each phase of school work by matching the grade norms up with the pupil's scores. In order to reduce all the grade variations to the same basis—the sixth-grade norms at the end of the year—for purposes of comparison, 3 was added to the average grade variation of each of the pupils of the low seventh grade (7B), 6 to that of each pupil in the high seventh grade (7A), and 9 to that of each pupil of the low eighth grade (8B). The 3, 6 and 9 were added, as the grade norms for the 7B, 7A and 8B grades are 3, 6 and 9 scale points respectively above the sixth-grade norm for the end of the year. As the pupils of the high section of the eighth grade were graduating, their scores were not usable in making the new classification and hence are not included on Chart 1.

From the chronological ages of the pupils, their mental ages, their intelligence quotients and their average grade variations in the scales from the sixth-grade norms, a diagram like Chart 1 can be quickly made out for the upper grades of a school. The placement of pupil number 84, for example, was located on the sheet by following down the chronological age column at the left of the chart until his chronological age of 13 years 4 months was reached. As his individual record card gave his mental age as 10 years 6 months, this was found in the row of mental ages at the top. Where the two columns arising at these two ages cross in the body of the chart is the pupil's location. This was indicated by his intelligence quotient of 79 being written in the middle of the square and his average grade achievement variation of —3.6 being written just below it in the bottom part of the square. The number 84, written in bold-faced type just above the placement will be used to identify the pupil later. These identification numbers, starting with 1 in the top row, are written consecutively across the chart from the left toward the right in each chronological age row. The ◇ was put around the placement of pupil 84 to show that he was just completing the 7B class and in line to enter the 7A class. The placements of the other 148 pupils were located in a similar manner. A ∧ was put above the placement of each pupil just completing the higher section of the sixth grade and in line for the low section of the seventh grade. To indicate that the pupil was in line to enter the 8B class a half circle, ⌒, was put above the placement, while a complete circle, ○, was drawn around each placement of pupils presumably just ready to enter the high section of the eighth grade. The oblique and horizontal broken lines indicate the basis of the reclassification to be suggested in Chart 2.

The most striking feature of Chart 1 is the mixture of grade indications. Frequently as many as three grades are represented in a small area on the chart. From the pupil's mental and chronological age placement, one can find no reliable basis for predicting the grade in which he is located. Nor will the intelligence quotients give any marked assistance, and even the achievement records are of but little more value. Pupils 14 and 18, for example, with mental ages nearly the highest in the group, with the two highest intelligence quotients, and with high achievement records, are only half way through the seventh grade. Pupils 13, 37, and 48 with mental ages of 14 years 8 months, 14 years 8 months and 15 years 6 months, respectively, and with intelligence quotients of 126, 122 and 126, and with practically beginning eighth-grade achievement records are located as beginning seventh-grade pupils among other pupils—numbers 39, 43 and 53—with mental ages under 11 years 6 months, with intelligence quotients under 95 and with achievement records three grades lower than those of the gifted pupils. Pupil 38, with a mental age of 14 years 10 months, an intelligence quotient of 123, and a beginning eighth-grade achievement record, has just completed the first half of the seventh grade with pupils chronologically two or more years older, with mental ages below eleven, with intelligence quotients below 75 and with fourth-grade achievement records. Pupil 96 with a mental age above 16 years, an intelligence quotient of 121, and an achievement record a year in advance of the eighth-grade norm for the end of the grade, has just completed the seventh grade in company with pupils 124 and 127, with mental ages of 11 years 4 months, intelligence quotients of 78, with achievement records half a year or more below the sixth-grade norm. Such instances as these make one hope that this is an unusual case of poor grading of pupils. On the contrary, this is probably a better classified school than is likely to be found in half the cases that may be surveyed. In this school more attention has been given to the promotion of able pupils than is usually the case.

The Present Classification of Pupils in This School Can Be Vastly Improved. On Chart 2 is pictured a reclassification of these pupils on the basis of their mental ages, their intelligence quotients, their achievement records, and the quality of their work. Because of their very high mental ages, high intelligence quotients and high achievement records it would seem advisable that pupils 89 and 96 be promoted at once to the high school even though they have just completed the 8B and 7A grades respectively. In selecting pupils to constitute the new high eighth-grade class certain standards have been provisionally set up for guidance. Those pupils have been selected first of all.

1. Who will be 14 years 5 months old mentally on completing the elementary school.
2. Who are less than 13 years 10 months old chronologically.
3. Who are within 7 months or 3½ scale points of reaching the 8B norm in achievement or 5½ scale points above the sixth-grade norm.

As this class is intended to be made up of the superior pupils, the standard has been set to conform closely with the normal mental age of 14 years 6 months for graduation from the eighth grade. To set it higher would exclude too many pupils. Pupils in the first half of the eighth grade or below it with chronological ages above 13 years 10 months are not likely to have intelligence quotients much above the average of 100. Pupils who enter the 8A class with an average achievement record already 7 months below the norm will need to do an unusual quality of work to approximate the eighth-grade norms at graduation time. The only reason for setting it so low is that otherwise too few pupils would be included in the 8A class. Although all these standards may seem too low, the class includes only 17 pupils who can meet these requirements. They are pupils 13, 14, 18, 23, 33, 34, 38, 48, 64, 66, 67, 79, 80, 83, 94, 95, and 97. These placements are all at the right of the oblique line number 2 and all have circles drawn around them. The class is obviously too small, so other pupils who fail to meet some of these qualifications have also been selected. Pupils 36 and 101, who are mentally and chronologically within the limits set up but slightly below in achievement, have been accepted. Also two pupils, 110 and 115, who meet all the requirements except the chronological age limits, have been admitted. Then there are six pupils—42, 47, 61, 69, 70 and 87—who meet all the requirements except mental age. As they are only slightly below in this respect, they too have been accepted. In order to obtain an eighth-grade class of reasonable size as compared with the others, several special cases have also been admitted. Pupil 32, for example, fails only slightly of meeting the mental age and achievement standard. Upon less substantial if not even questionable grounds seven other pupils have been admitted to the class to even up the numbers in the four new seventh- and eighth-grade classes. Because of their fairly high achievement records pupil 134 was accepted in spite of his high chronological age, somewhat low mental age, and low intelligence quotient, and pupil 76 in spite of her very low mental age and low intelligence quotient. Pupils 107 and 126 were accepted because their high mental ages would seem to somewhat offset their low achievement records and poor quality of work. On account of their fairly favorable achievement records and their fairly high mental ages in comparison with the limits, pupils 121, 122 and 148 were also admitted even though their chronological ages are too high and their intelligence quotients too low. It is needless to add that the inclusion of these seven pupils is likely to detract considerably from the homogeneity of the class. Yet, because of their fairly high mental ages or because of their fairly high achievement records and because they have already been through the first half of the eighth grade, it would seem unwise to demote them, especially as there is no other group into which they would fit any better. The inclusion of the 18 additional pupils, whose placements also have the circles around them in Chart 2, has been based upon a trial selection. Other pupils might have been chosen and more wisely had some experimental data been available upon which to base the decisions.

For the new low eighth grade (8B)—the pupils who will complete the eighth grade at the end of the following year—those pupils have been chosen

1. Who will be at least 12 years 7 months old mentally at the end of the 8B grade.
2. Who are 12 years 10 months or older chronologically.
3. Who are within 15 months of the seventh-grade norm for the end of the year or not more than 1.5 scale points below the sixth-grade standard.

The limits have been set for this group so that it will be composed of the less gifted children. When they complete the 8B grade they need be only a month in advance of the normal mental age of sixth-grade pupils at the end of the year. The chronological age limit has been set to include only those with intelligence quotients below 100. Even in achievement the lowest will be only slightly in advance of the sixth-grade norm when the 8B grade is completed. This group consists of pupils 65, 68, 75, 77, 78, 81, 86, 92, 93, 99, 100, 103, 104, 111, 112, 119, 123, 125, 128, 130, 131, 132, 145, 146, and 147. These 25 pupils whose placements lie between the oblique lines 1 and 2 and below the broken horizontal line, and have a circle, ◠, above them, without an exception have intelligence quotients below 100. In order not to overcrowd the two lower classes 17 additional pupils, most of whose qualifications vary but slightly from the standards, have been placed in this group. Pupils 51, 54, 59, and 62 meet all the requirements except that they are a little below the chronological age limit. Their intelligence quotients make them eligible, however. A few more pupils—91, 135 and 137—are slightly below in the mental-age requirement alone. Pupils 74 and 98 are slightly below in achievement only. Two pupils—51 and 135—would have been in the higher section of the eighth grade, but as there would seem to be still less reason for including them in it than for including the seven questionable cases already admitted they have been placed in the low section of the eighth grade, along with the others just mentioned. Three additional cases—pupils 120, 140 and 142—who would originally have been placed in the higher section of the eighth grade have also been included in this section. Although they are somewhat below the achievement standards set up and two of them are considerably below the mental-age standard, it would hardly seem wise to demote them more than half a grade. Cases 57, 105, and 113, are pupils of about the same qualifications as the previous three. They will probably succeed better in the low eighth grade than they would succeed if demoted a whole year, nor will this group of half a dozen pupils be likely to detract seriously from the homogeneity of the class as a whole, since they have a number of traits, such as high chronological ages and low intelligence quotients, in common with the rest of the group.

Very different in some respects are the pupils who have been selected to make up the new high seventh grade.

1. They must have a mental age of 12 years 7 months at the end of the 7A grade. This is the same as the new 8B standard.
2. They must have a chronological age under 12 years 10 months instead of above it as for the new 8B class.
3. They must be within 15 months of the beginning 7A achievement norm or not have an average grade variation below —4.5, which is a half grade lower than that set up for the new 8B grade.

There are 24 pupils who meet these requirements—numbers 1, 2, 3, 5, 7, 10, 11, 19, 20, 21, 22, 26, 27, 29, 30, 35, 37, 45, 46, 49, 52, 56, 60, and 63. Their placements are at the right of the oblique line 1 and above the broken horizontal line. Not one of them has a mental quotient below 100. Thus in rate of achievement and gain in mental age they are a decidedly different group than the new 8B class. Pupil 56, who would originally have been promoted to the 8A grade, is not even retained in the 8B grade but demoted to the more advanced 7A grade in which he is placed with pupils more like himself. To bring up the class to a reasonable number, 11 more pupils whose qualifications do not differ markedly from the standards set up for the new 7A grade have been included in this group and their placements marked with a diamond, ◇. Pupils 82 and 88, although possessing the chronological age qualifications, have also been retained in the high seventh grade because of their mental ages and intelligence quotients. In spite of their low achievement records pupils 16, 17, 31, 41, and 55 have been taken into the group, as their other qualifications fit them so much better for this class than for the low seventh grade. Pupils 24, 25, 40, and 44 are admitted for the same reason. Undoubtedly these eight pupils will not add to the homogeneity of the group but they would be more serious misfits in any one of the other groups.

The majority of pupils as yet unplaced will make up a low seventh-grade class, similar in most respects to the low eighth grade. A pupil to qualify for this grade rather than the low eighth grade should not become over 12 years 7 months mentally at the end of the half grade unless his achievement record is five or more points below the sixth-grade achievement norm and should have an achievement record not higher than —3, which is half a grade below the sixth-grade achievement norm. To qualify for this group rather than the high seventh grade the pupils should have an intelligence quotient of less than 100, as in the cases of pupils 39, 43, 50, 53, and 58. These qualifications include pupils 71, 72, 73, 84, 85, 102, 106, 108, 109, 114, 116, 117, 118, 124, 127, 129, 133, 136, 139, 141, 143 and 144. Also included in the new 7B grade are pupils 106, 109, 114, 118, and 129, who are too low in achievement to be included in the low eighth grade, and too high in chronological age as well as too low in achievement to be included in the high seventh grade. While no lower limits with respect to mental age or achievement have been set for this grade, owing to the fact that the survey did not extend through the lower grades, it is obvious that the achievement records of pupils 90 and 138 would undoubtedly place them in a low sixth grade. Furthermore, the pupils designated 4, 6, 8, 9, 12, 15 and 28, with mental ages below 12 years 3 months, with chronological ages below 11 years 9 months, except in one case, with intelligence quotients around 100 and with very low achievement records, except in one case only, are such apparent misfits in either the low seventh grade or the high seventh grade, that it would seem advisable to place them in the high sixth grade. Unquestionably pupils would have been found in the sixth grades, had the survey extended farther down, who should be placed in either the low or high seventh grades.

The lines of demarcation set up for this classification are empirical. The adjustments of the special cases are arbitrary. For some time to come many of these special cases will have to be adjusted on the basis of opinion rather than on the basis of definite information. The mental and educational measurements, however, give a basis for arriving at some decision.

Somewhat different lines of separation and different adjustments in special cases might have resulted in just as adequate a classification. Such specific issues, however, are of minor importance in comparison with the general tendency to place together those pupils who can best be taught together. As schools differ so widely in their pupil composition and in their quality of work, the specific limits set up for separating the pupils of a school into homogeneous instructional groups must be worked out for each local situation. This, however, can be readily done from the data entered on a classification sheet.

While it may be somewhat tedious to follow in detail the discussion dealing with this new classification, the actual task of reclassifying the pupils in a school becomes even more engrossing than a game of chess. For here the pawns are human beings and the moves affect human careers. The responsibility, however, is in no wise lifted from the shoulders of the principal by an ignoring of the whole question or by an unquestioning reliance upon the teachers' judgments in the matter of promotion and classification. In this process of classification on the basis of an intensive survey, all of the principal's experience, good judgment and scientific information, as well as all the information and suggestions that may be gathered from the teachers, will be called into play. The need for definite information will be felt as never before. Many false moves may be expected, but they will be less extensive and less disastrous as well as fewer in number than the many blind ones usually made. Where a careful record is kept of each decision and its consequences carefully checked up, errors in the placement of unusual cases will be gradually reduced to a minimum. In making the new classification the only information available was the previous grade placements of the pupils, their chronological ages, their mental test scores and their educational scale scores. Little attention was given to the previous grade placements except in the special cases, where they were frequently made the determining factor. With a more adequate basis of classification in the lower grades comparatively few of such special cases would arise. Yet in spite of these necessarily crude adjustments, the improvement in the homogeneity of the grouping resulting from the new classification is truly astonishing. Before discussing this in detail, it will be interesting to note the changes in grade placement from the original classification to the new, as summarized in Table 12.

Changes Resulting from the Reclassification of Pupils in Grades 7B Through 8A (Table 12). Of the 37 original low eighth-grade pupils, all of whom were scheduled for promotion to the high eighth grade in the original classification, as indicated in the first column of Table 12, 1 is suggested for promotion to the high school, 19 for promotion to the high eighth grade, 16 for repetition of the low eighth grade, and 1 for demotion to the low seventh grade. Instead of all the 38 pupils in the original high seventh grade being assigned to the low eighth grade, as in the original classification, 1 is suggested for promotion to the high school, 8 for promotion to the high eighth grade, 20 for promotion to the low eighth grade, 2 for retention—actually promotion—in the high seventh grade, and 7 for demotion to the low seventh grade. In the other two classes similar changes are planned. It will be noticed that the amounts of promotion and demotion in the low eighth grade and the high seventh grade come out very evenly balanced.

TABLE 12.

Retentions and Changes in Grade Placements from the Original Classification to the New Classification.

Grades in Which Pupils Have Been Placed in the New Classification	Grades in which pupils were placed in original classification				Total in Each Grade in New Classification
	In High Eighth or 8A	In Low Eighth or 8B	In High Seventh or 7A	In Low Seventh or 7B	
High School	1	1	0	0	2
High Eighth Grade or 8A	19	8	6	2	35
Low Eighth Grade or 8B	16	20	4	0	40
High Seventh Grade or 7A	0	2	4	19	35
Low Seventh Grade or 7B	1	7	10	9	27
Demoted to Sixth Grade	0	0	1	8	9
Total in Each Grade in Original Classification	37	38	35	38	148

Turning for a moment to the new high eighth grade, it will be apparent that 19 of its 35 pupils are drawn from the original low eighth grade, 8 from the original high seventh grade, and 6 from the original low seventh grade and 2 from the original high sixth grade. Of the 148 pupils in the four upper grades, 62 are retained by the new classification in the grades in which they would have been placed if regularly promoted, 67 are changed a half grade—32 being moved up and 35 scheduled for repeating their last half grade—16 are changed a whole grade—7 being moved up and 9 down, while three are changed a grade and a half—2 being moved up and 1 down. Such an amount of change may well seem excessive even though there are only 10 actual demotions and 35 repetitions suggested. It must indicate either a radical disorganization as a result of the new classification or else the possibility of enormous improvement in the original classification. Should the amount of homogeneity in the groupings in the two classifications turn out to be equal, then no improvement would have been effected by the reclassification. To the extent that a smaller amount of homogeneity might result, the new classification would have been wholly unjustified. The amount of improvement that might take place in the homogeneity of the groupings as a consequence of the reclassification would show the improvement in the groupings as well as the urgency of the need for it.

Improvements Resulting from the Reclassification. Only a glance through Table 13 is needed to show the greater homogeneity of the grades in mental ages under the new classification, as well as the greater differentiation from grade to grade. With the exception of the high seventh and low eighth grades—designated 7A and 8B respectively in the table—there is comparatively little overlapping from grade to grade and such as there is, is largely due to the adjustments of the special cases. While the mid mental ages for the four original consecutive half grades differ by less than 2 months in two instances and by only 7 months in the third instance the differences between the mid mental ages in the new grades is very marked—17 months between the 7B and 7A grades, 5 months between the 7A and 8B grades, and 23 months between the 8B and 8A grades. The difference between the mid mental ages of the 7B and 8A grades

TABLE 13

Distributions of Mental Ages in the Original Classification and in the New Classification

Mental Ages. Yrs-Mos	Original Classification with regular promotions 7B	7A	8B	8A	New Classification 7B	7A	8B	8A
10-5		1			1			
6		1			1			
7								
8								
9				1	1			
10	1	1			1			
11								
11-0								
1	1			1			1	
2	1				1			
3	2				1			
4	1	1	3		4		1	
5	3				2			
6	1		1	2	-2-		2	
7		1			1			
8			2		1		1	
9	1	1	1		2			
10	1	1	1		2		1	
11	1		1	1	1		1	
12-0	2	2				3		
1	1	3	1		2	1	2	
2	2		1				1	
3	1	1	2	4	2	1	4	1
4	--	3	2	1	2	1	3	
5				2			-3-	
6	1	-2-		1		3	1	
7	1	3	-3-			3	4	
8			2				2	
9	2	1		1		3	1	
10	1	1	1	1		1	3	
11	2	1		1		-3-	1	
13-0	1	1	2	2	1		4	1
1	1			1		1		1
2	3		1	-2-		3	1	2
3	1		1	1		2	1	
4			2					2
5		1	1	1				3
6		1		1		1		1
7								
8		1	2			1	1	1
9	1	1				2		
10		1				1		
11			2	1			1	2
14-0	2	1				3		
1								
2				2				2
3		1				1		
4				1				1
5				1				-1-
6								
7								
8	2		1	2		1		4
9				1				1
10		1	1	1				3
11			1	2				3
15-0				2				2
1			1					1
2								
3								
4								
5								
6	1							1
7		1						1
8								
9				1				
10								
11								
16-0		1						1
1								
2								
3			1					

TABLE 14

Distributions of Chronological Ages in the Original Classification and in the New Classification

Yrs-Mos	Original Classification with regular promotions 7B	7A	8B	8A	New Classification 7B	7A	8B	8A
10-5								
6	1					1		
7								
8								
9								
10								
11								
11-0								
1						1		
2								
3	1					1		
4	2					1		
5	1					1		
6	4					2		
7	1	2						
8	3	1				2		1
9	2	2	1			4		1
10	1	1				2		
11	1	1	1			2		1
12-0	-3-	2		1		-3-		2
1	1	2	1			2		2
2	-2-	2			1	2		1
3	4	2			1	3		2
4	1					1		
5		-2-	1		1	1	1	
6								
7	1	2	1		1	2	1	
8	2		1	1	1	1	3	
9		1	2	1		1	1	2
10			2				1	1
11			1					1
13-0		1	2	2			3	-2-
1	1	1	3	2	3		2	2
2				1				1
3		1	1	1		1	1	1
4	1	2	1	2	2	1	1	1
5	1		-2-	3			2	2
6			1	1			1	1
7			2	2			3	1
8		1	2		1		-2-	
9			2	1	1		1	1
10								
11								
14-0	1		1	-2-	-2-		1	1
1			1				1	
2			2	1	1		1	1
3		3		4	3		2	2
4				1			1	
5			1	1	1		1	
6			2		1		1	
7		1	2	1	1		2	1
8				1			1	
9		1		1	1			1
10				1			1	
11		2			1		1	
15-0	1		1		1			
1								
2								
3				1			1	
4								
5	1				1		1	
6				2	1			
7								
8	1				1			
9								
10								
11								
16-0				1			1	
1								
2				1				1
3				1			1	

under the old classification is less than a year, under the new classification it is nearly three years.

The only disturbing factor under the new classification is that the mental ages of the low eighth-grade class are lower than the mental ages of the high seventh-grade class. This condition is intentional, however. From Table 14 it is obvious that in chronological ages the situation is just reversed. The chronologically older pupils have been grouped together in the low seventh and low eighth grades, while the chronologically younger pupils have been placed in the high seventh grade and high eighth grade. A considerably greater homogeneity in chronological age has also been effected under the new classification than was present under the old, where to secure it the younger, brighter pupils were held back and the older and less capable pupils were pushed along. With such regroupings as have here been made no bright pupil need be unduly held back for fear he will be placed among older pupils with whom he will be at a disadvantage. Nor need the less gifted pupils be unduly accelerated for fear of their feeling out of place with the younger pupils. The reclassification has worked almost as advantageous changes in the chronological age groupings as in the mental age groupings. Where there is a marked lack of homogeneity in chronological age, it is due in most cases to the placement of the special cases.

A still more marked advantage is to be seen in the effect of the regrouping upon the distribution of intelligence quotients. With the exception of the high eighth grade, which includes some of the unusual special cases, the distribution of intelligence quotients in any one of the new grades is shown in Table 15 to be only about half as wide as in any one of the original grades. This insures markedly less variable rates of gain in mental age within any one of the grades than is usually to be found.

The one important factor yet to be taken into account, and the one which is supposed to play the important part in the original classification is, of course, that of achievement. In Table 16 are given the distributions of the individual variations from the sixth-grade norm for both the original grades and the new grades. Even in this phase there is marked improvement as a result of the reclassification on the basis of mental age, rate of gain in mental age, achievement and quality of work. A

TABLE 15

Distributions of Intelligence Quotients in the Original Classification and in the New Classification

	Original Classification with regular promotions				New Classification			
AQ.	7B	7A	8B	8A	7B	7A	8B	8A
70	1			1	1			
1								
2			1	1			2	
3		2			2			
4	2				1			
75	1			2	1		2	
6								
7								
8			3	1	3		1	
9		2			2			
80								
1	1	1		1			1	
2		1	1		2			
3			2	1			2	1
4	1	1			2			
85			1				1	
6		1	1	2	2		2	
7			1				1	
8	1	1	1		2		1	
9	1		1	3	2		2	1
90			3	2	1		4	
1				1			-1-	
2		1	2		1		2	
3	4	1	-3-	3	5		4	2
4			1	1			1	1
95							2	
6			1	-1-			3	
7		1	2				2	
8	1	1	2	1	1		4	1
9	2	2	1	3		2	1	1
100	1	1						
1	2	1				2		
2		-2-		1		2		1
3	1		3			2		2
4	-4-	2				3		
105	2	1				3		
6			1					1
7	2	3		4		-4-		5
8				1				1
9	1	2	1	1		3		-2-
110		2		1		1		2
1	1			1		1		1
2			1	1				2
3	2	1	1			3		1
4	1		1			1		1
115		1	1	1		1		2
6								
7								
8	1					1		
9	1	1		1		2		
120								
1			1					
2	1			1		1		1
3	1	1				1		1
4								
125	1					1		
6	2		1					3
7								
8								
9								
130								
1								
2								
3		1						1
4								
135								
6								
7								
8		1						1

TABLE 16

Distributions of Achievement Variations from Sixth Grade Norms in the Original Classification and in the New Classification

	Original Classification with regular promotions				New Classification			
	7B	7A	8B	8A	7B	7A	8B	8A
-15	4				1			
	1				1			
-14		1			1			
	1	1			1			
-13					1			
	2	1			2			
-12	1							
	1							
-11	1	2			3			
-10								
	1							
-9		-1-			1			
	3				2	1		
-8								
-7	3				-2-	1		
		2	1		2	1		
-6	-2-	1			1	2		
	2	1	3		3	3		
-5	1		2		2	1		
	1	1				2		
-4	1	4			4	1		
		1	1	1	1	1	1	
-3	3			1		3	1	
			3	1			4	
-2		-3-	2			1	4	
	2	1	2	2		-2-	5	
-1	1			1		1	1	
		1	4	1		2	-4-	
0	1	1	-2-	1		3	2	
		1					1	
+1	1	1		4		2	3	1
		1	1	2		1	2	1
+2			2	1			3	
				1			1	2
+3	3	2	1	2		5	3	1
				-1-				1
+4		1	2	1		1	2	1
		1						2
+5	1		3	1			3	2
	1	1		1		1		-8-
+6		3	3	2				2
			1	1				1
+7			1					2
		1		1				3
+8			2	1				1
				1				1
+9				1				2
				2				2
+10				1				1
				1				
+11								1
			1	1				2
+12				2				
+13								
+14								
+15								
+16								
+17								
+18								

reduction of the spread of the variations by from one third to one half has been accomplished. With the exception of the high seventh and low eighth grades not only have the mid scores been spread apart somewhat more widely, but the overlapping has been enormously reduced. That some improvement would result in each of these phases as a consequence of the reclassification might well have been expected. That so much improvement could be attained in all of them is indeed astonishing.

CHAPTER X

CLASSIFYING THE PUPILS IN THE SMALL CITY GRADE SCHOOL

In no part of the public school system have more serious problems of classification and promotion arisen than in the small city grade school. Usually there is only one class in a grade and the promotions occur only annually. The fact that retention or acceleration involves a whole year's work makes for regularity of promotion. The smallness of the school population tends to discourage any attempt toward a more homogeneous grouping of pupils for instructional purposes. In the small high school, lacking in facilities for curriculum differentiation, the increasing influx of the less gifted children must result either in a high percentage of failure or else in a lowering of standards. In both the elementary school and the high school classes in the smaller community there is likely to be an even wider variability in both capacity and achievement than needs to be found in the classes of any city school with its more frequent promotions and greater opportunities for capacity grouping of pupils. Yet the small city school is not without facilities if it would but take advantage of them.

The view that each successive grade in school should involve more difficult content than the preceding one is largely a traditional one. It does not for a moment imply that all the pupils in any grade are farther advanced either in capacity or achievement than even the average pupils of the preceding grade. Mental and educational measurements of consecutive grades have repeatedly demonstrated that just the opposite tendency is almost universal. Wide overlapping of consecutive grades is quite the condition to be expected. Nor is the condition always confined to a partial overlapping of consecutive grades in a large city school. Occasionally a grade becomes the catch-all for the less gifted students from several grades. No one in the school expects such a grade to make normal progress. Yet its grade label is not changed. The group may even be graduated from the elementary school with the knowledge that it is a weak class and also with feelings of misgiving and compunction. Usually the situation has been allowed to develop incidentally or accidentally rather than intentionally. Nevertheless its intentional development is exactly the tendency suggested in the previous chapter. When a grade is consistently made up of pupils with similar mental and chronological ages but with intelligence quotients below the average no one can reasonably expect them to make a normal achievement attainment for the grade with which they are likely to be labelled. If they are allowed to progress through school as a unit in a slower but regular way and graduated at the end of eight or even nine or ten years, they will not have achieved the eighth-grade attainment standards. Nor should they be expected to. As a matter of fact, these same pupils if scattered among the various grades in the usual fashion would finally be graduated from the elementary school with no higher attainment records than are characteristic of their grade when they are grouped together. The fact that there are fewer of them at any one time merely makes them less conspicuous but does not change their status in the least. Whether they enter the large city high school as a group or in small numbers from year to year practically the same fate awaits them. If the small high school retains them longer than the larger one it does so through lower standards for it lacks the facilities possessed by the larger high school for differentiation into more courses.

Classification on the Basis of Mental Tests and Achievement Scales Is Quite as Much an Advantage to the Small Graded School as to the Larger City School. When the suggestion is ventured to the principal of a small city grade school or to the principal of a consolidated school that educational measurements are quite as essential for classification and promotion purposes in these schools as they have been shown to be in larger city schools, the question at once arises as to what adjustments could possibly be made for pupils to progress at different rates when promotions are made only once a year. Some acceleration and retardation seems feasible of course. But a complete reorganization is another matter. Yet there are no fundamental reasons for keeping the consecutive grades consecutively increasing in difficulty of content, as there are for grouping the pupils on the basis of their capacity and achievement instead of merely trying to adjust them to grade labels. Could the pupils in the seventh and eighth grades, for example, be grouped in such a way that the pupils with the higher mental ages, higher intelligence quotients and higher achievement records would be placed in the eighth grade while those with the lower mental ages, lower intelligence quotients and lower achievement records would be placed in the seventh grade, more homogeneous grouping for instructional purposes would at once be accomplished. At the same time the eighth-grade group upon graduation would also enter the high school as a relatively homogeneous unit. Most of these students might well be expected to succeed in the usual academic work offered in the small high school.

But what of the seventh grade? In two years they will have completed the seventh and eighth grades but owing to their lower mental ages, lower intelligence quotients, and low achievement records they will not have reached the eighth-grade standards even though labelled eighth-grade pupils. Nor would they have reached the eighth-grade standards if they had been left in their original groups. The fact that they are completing the eighth grade in larger numbers alone makes the problems seem more acute. Should they be allowed to enter the high school with their low mental ages and inadequate elementary school preparation? The superior eighth-grade class, of course, set a new standard. Will their condition be materially improved if they are retained in the elementary school a year longer? They will be mentally older and they will have a wider acquaintance with the elementary school subjects if they remain in school, but these may be secured at the expense of desirable attitudes. Had they entered the high school in their original groups most of them would have dropped out by the end of the first year. But if all enter and drop out together there will soon be a year practically without a sophomore class. Other classes will, of course, be larger, for few of the superior eighth-grade group will fail in their high school work.

But the situation is brighter than it first appears. The pupils of this less gifted seventh-eighth-grade group tend to drop out of high school early in their careers because they are not adapted to the work of the high school. Since the group is a relatively homogeneous one it may seem more worth while to adapt the work of the high school to the capacities and abilities of these students. In mathematics a simpler course than algebra may need to be provided for them. The courses in English and the social sciences may have to be made much simpler and more concrete in content. For these less gifted students a vocational course may well be substituted for a modern language. The differentiation suggested for the freshman year might well be continued through the remaining years of the high school. Nor would more teachers be needed for a differentiated program that might thus better meet the needs and capacities of the students of the small high school, for the same courses would need to be given only every two years instead of every year.

The Pupils in a Small City Graded School Can Be Grouped into Far More Homogeneous Classes than at Present Prevail. Both the conditions of classification and improvements that are feasible in a small graded school will be clarified by an illustration. The school whose pupils' placements are entered on Chart 3 in the same way that the placements of the pupils in the large city school were entered on Chart 1 is a typical small city graded school. It has one class to a grade and annual promotions. Nearly the entire eighth-grade graduating class enter the high school but a large proportion of the less gifted drop out during the freshman year.

The pupils just completing the sixth grade are designated on Chart 3 with a ∧ above their placements, while those completing the seventh grade are indicated by a ⌒ above their placements. Of the 17 pupils with chronological ages above 13 years 6 months not one has an intelligence quotient as high as 95 while 11 have intelligence quotients below 90. Only one of the 17, pupil 47, has an achievement record higher than that of an average sixth-grade pupil at the end of the year. To make the average achievement records comparable they have all been reduced to variations above or below the sixth-grade norm. As six points is equivalent to a year's work, even pupil 47 is failing to attain the beginning eighth-grade achievement norm. As the oblique dotted line has been drawn to include on its right all pupils who will have mental ages of 14 years 6 months a year hence, only four of the 17 pupils—39, 48, 50 and 54—will have attained the normal mental age for completing the eighth grade at graduation time. Their low intelligence quotients indicate their early completion of the regular high school course. Pupils 45, 47, and 52 will be likely to fare but little if any better in the high school even though they are scheduled to enter the eighth grade.

At the right edge of the chart are four pupils—18, 31, 33 and 36—who have mental ages of 15 years or older, intelligence quotients of 113 or higher and average achievement records equal to those of the best quarter of the class that just completed the eighth grade in this school. In achievement pupils 31 and 36 are above the eighth-grade norm and pupils 18 and 33 well above the seventh-grade norm. Surely these four pupils do not belong in the same class with pupils 39, 45, 47, 48, 50, 52 and 54, from whom they differ by nearly two years in achievement in addition to the marked differences in mental ages, in intelligence quotients and in chronological age. In a somewhat larger school system the experiment was tried of promoting eight pupils similar to these four in mental ages, in intelligence quotients and in achievement attainments, directly into the high school. The fact that all eight of the pupils thus advanced have so far stood well up in the upper half in nearly all of their high school classes is evidence of the practicability of the plan for taking care of the few exceptional pupils in the seventh grade of a small school system.

At the right of the dotted oblique line there are 12 other pupils who will be mentally 14 years 6 months or older a year hence. All are below 13 years 6 months chronologically and all have intelligence quotients of 107 or above. With the exceptions of pupils 23 and 37 they have average achievement records higher than the sixth-grade norm. This group of 12 pupils may well form the nucleus for the new eighth grade. Although three of them—4, 5, and 8—have just completed the sixth grade they are as well qualified for eighth-grade work as the other nine. In fact, pupil 8 leads the 12 pupils in achievement. Pupils 6, 11 and 12, whose placements are located between the oblique lines, are quite as well equipped to take up eighth-grade work as pupils 19, 26, 32 and 35, even though the latter have just completed the seventh grade and the former only the sixth grade. Should pupils 39, 45, 47, 48, 50, 52 and 54, whose placements appear at the bottom of the chart, be included in the eighth grade with the 19 pupils of average or superior intellect? The fact that they have completed the seventh grade, that they are quite as high in achievement as some of the 19, that they have as high mental ages, and that there is no better place to put them probably offsets the differences in intelligence quotients and chronological ages. Yet these seven will have little chance of succeeding in the same high school courses that are adapted to the other 19.

The rest of the pupils—those at the left of the continuous oblique line—with but few exceptions form a relatively homogeneous group in mental age, intelligence quotients and achievement attainments. The oblique line is drawn to include at the right all those who will be at least 13 years 6 months old mentally a year hence. The few pupils with the higher intelligence quotients and higher achievement attainments—pupils 2, 7, 10, 13 and 16—may well be included with the brighter portion of the new sixth grade while the less gifted of the present fifth grade —those chronologically older and with low intelligence quotients—may well be grouped with the pupils left to make up the new seventh grade. In this reclassification four of these pupils —2, 7, 10 and 13—would in reality be promoted by being placed in the sixth grade. Pupil 16, with a mental age of only 12 years 3 months and only half way through the fifth grade in achievement, is surely not ready to enter the eighth grade. Some drastic measure needs to be taken to correct his evidently too rapid promotion in the earlier grades. Neither letting him go on with the eighth grade to fail nor placing him in the seventh grade with the less gifted pupils would be as much an advantage to him as placing him among a group of gifted pupils in the sixth grade. His case would certainly have to be handled carefully and tactfully but it could be done. Pupils 34, 41, 42, 46 and 53, who have just completed the seventh grade, are all obviously disqualified for the eighth-grade class in at least two respects: mental immaturity, low intelligence quotients, or low achievement attainment. Pupil 41 is, of course, the most serious case, as his achievement record is only half a year below the sixth-grade norm. He should be carefully retested before a final decision is made to retain him in the seventh grade.

Significant Advantages Will Arise from This More Adequate Classification of Pupils. As far as the eighth grade is concerned one may be inclined to think that the inclusion of the seven pupils with the high chronological ages destroys whatever homogeneity is gained. To some extent it does. There is still just as wide a range of chronological ages. By leaving in the seventh-grade pupils whose placements are at the left of the continuous oblique line on Chart 3, the range of intelligence quotients is somewhat reduced. The retention of these five pupils and the promotion to the high school of the four pupils with mental ages of 15 or above decreases the range of mental ages from 4 years 3 months to 2 years 5 months or more than 40 per cent, and at the same time decreases the range in attainment by nearly 50 per cent. But even if the seven chronologically over-age pupils cannot be successfully taken care of in the present reclassification, the recurrence of such a situation can be readily prevented in the future and with it the excessively wide range of chronological ages and intelligence quotients in the eighth grade.

In the seventh grade the highest mental age has been reduced from 14 years 0 months to 12 years 6 months, the highest intelligence quotient from 122 to 97, the highest average achievement attainment from that of a pupil half way through the eighth grade in the case of pupil 8 to that of a pupil not more than half way through the sixth grade, or with the exception of pupil 41, to that of a fifth-grade pupil. This new seventh grade is a fairly homogeneous class. It is made up of less gifted pupils, with a fourth-grade to fifth-grade achievement attainment and approximately a beginning sixth-grade mental age. Of course these pupils cannot do seventh-grade work. Very few of them will be doing seventh-grade work when they complete the eighth grade. But perhaps they do not need the normal eighth-grade skills, ranges of information and abilities. Very few such pupils do achieve them. In two years these pupils can enter high school as a fairly homogeneous unit. A few of the older ones will have dropped out, of course. The rest can gain something from a high school course of study adapted to their needs and simple enough to lie within their range of comprehension.

By retaining in the sixth grade the few brighter pupils, promoting to it the most gifted and advanced pupils in the fifth grade, and promoting to the new seventh grade the pupils with the high chronological ages, low intelligence quotients and low achievement attainments, a homogeneous but superior sixth-grade class would be evolved. Such a class would undoubtedly very soon overtake and surpass the seventh grade in achievement. By the time they enter the eighth grade they would be far in advance of the less gifted eighth grade upon entering high school. But this need not be a matter of alarm for these superior pupils will need wider ranges of information and more developed abilities in the elementary school branches to meet the problems arising in their more exacting high school activities as well as in their later more complex social and professional activities than will the group less favored in mental endowment. At the same time there will be markedly less repetition of grades in the elementary school, less elimination from the high school and an absence of any stigma that might possibly be attached to significantly labelled mental groups in a small community.

A classification of pupils based on mental age, intelligence quotients, actual achievement, and quality of work is not only feasible in the small school system or small school, but at the same time may be made the basis of better chronological age grouping and also of differentiated and more effective courses of study in the high school. The gains in achievement, in school retention, and in information and skills better adapted to the needs of the individual pupils will many times repay for the expense and the few hours necessary for the testing, scoring of papers, entering the scores on the class cards and making out the classifications. In addition there will be a saving of a full year or more for the brighter pupils, who, if given an opportunity to work to their full capacity in more homogeneous classes will undoubtedly complete the work of the elementary school in the shorter amount of time and be better equipped not only in habits of work but also in the ranges of information and in the skills requisite for successful work in the high school.

CHAPTER XI

CLASSIFYING THE PUPILS IN A LARGE CITY ELEMENTARY SCHOOL

The problem of classifying the pupils in a large city elementary school is a very different one from that of grouping the pupils in the smaller city school or the small city graded school. In some respects it is a simpler problem, especially when the pupils come directly from the next lower grade in the same building. The very fact that the numbers are large makes finer gradations possible. The large amounts of overlapping from one half grade to the next accompanying the smaller half grade differences adds to the complexity of the classification process, however. Where pupils in each half grade are grouped into several sections, there are sure to be sections in the consecutive half grades that are more nearly like one another in some respects than they are like the other sections in their own half grade. Between the first section of a 6A grade, the second section of a 7B grade and the third section of a 7A or an 8B grade there may be small difference in either mental age or achievement attainment. To maintain clear-cut distinctions among the many grade sections in some significant respects is not always simple, nor is it always an easy task to decide, independently of the grade that the pupil has just completed, just which grade and section is best suited to the capacity, attainment and quality of work of each pupil. No school problem, however, more forcibly suggests the need for competent supervision to maintain a relatively even distribution of emphasis from one phase of school work to another and a relatively even quality of work in all phases of instruction on the part of each pupil. A satisfactory solution of the problem of pupil classification in the large elementary school also contributes in a large measure toward the solution of two other significant problems with which the elementary school is confronted: the problem of fostering acceleration and reducing retardation and elimination and the problem of adjusting the elementary school standards and the changing high school entrance conditions.

The Present Process of Retention and Acceleration in the Elementary School Is a Temporary Expedient. It arose to offset the misadjustments growing out of chronological age classification of pupils. Pupils who fail in the effort or lack the capacity to achieve even an approximation to the grade standards are frequently left in the same grade for another year. Their retention relieves the newly formed classes of a serious handicap but that it helps the pupils left behind is coming to be seriously questioned. More rapid advancement of the gifted pupils has been a process slower of realization. There is commonly the feeling that in an extra promotion some essential work will be missed and the pupils thereby handicapped in their later work. That it has little foundation in fact helps but slightly in allaying the feeling, however. More rapid promotion means grouping the chronologically less mature with older children. This is commonly viewed with disapproval, especially when the younger pupils are also small in stature. Then, too, the superior pupils are not always discovered. With little stimulation to prompt them to make an average effort they frequently fail to rise noticeably above the average pupils in achievement. The recent reaction toward enriching the curriculum for the gifted pupils while keeping them in the usual classes is likely to result in merely giving them more work of an average level of difficulty or else letting them shift for themselves with a more varied content. There are cases where the gifted pupils, when discovered, are set to helping the less gifted pupils or even to acting as school messengers. This may seem like a noble effort toward equalization of opportunity but in the long run is likely to prove a costly expedient to social welfare.

With an adequate classification of the pupils in a grade the necessity for retention and acceleration can be immediately reduced to a minimum. The various ability groups can be regularly promoted from year to year. For the less gifted pupils there need be little of the discouragement and chagrin that come from being left behind. The superior pupils need not be treated as special cases but the content may be adjusted to their capacity as a group. It is quite true that if all are kept in the elementary school for the same length of time they will, upon completing the final grade, vary widely in abilities and ranges of information if they have been kept working at an average quality. They may even differ in achievement to a greater extent than they do now but they will differ less in quality of work. But differences in achievement for different ability groups may be highly advisable. The main danger is that the groups differing widely in capacity will differ far less widely in achievement. In case the superior and gifted children are felt to be acquiring too great abilities in the elementary school subjects several better remedial measures than checking their progress are open. They may be sent to the high school as a group somewhat earlier or a more varied and difficult content may be introduced in the upper grades of the elementary school. Care needs to be taken, however, that enrichment does not consist merely of assigning additional tasks of the same difficulty. A teacher of a gifted class in algebra when informed that the class could cover twice as much ground as the usual class proceeded to make the assignments twice as long. But instead of covering twice as many topics each day she assigned twice as many tasks for each topic taken up. The fact that this teacher is not a striking exception is one of the reasons why ability grouping is occasionally found to fail in leading to better achievement on the part of the superior pupils. To insure success it is also essential to place the gifted pupils with gifted teachers.

A New Adjustment Between the Elementary and High School Is Needed. As long as chronological age was the fundamental basis of classification in the elementary school and only the more gifted pupils went on to the high school, the adjustment between the elementary and high school was a relatively simple one. The high achievement status of the gifted pupils provided the bond between the two institutions. Two recent tendencies have greatly disturbed this adjustment, however. The more rapid acceleration of the gifted pupils in the elementary school and the increasing proportion of elementary school pupils who enter the high school have had a marked effect upon the secondary instructional situation. With this increasing proportion of pupils entering the high school, the composition of the group has also changed.

Secondary education is no longer limited, theoretically at least, to the gifted pupils. At the same time the high school teachers are much perturbed by the growing lack of an adequate elementary school foundation for successful high school work. It seems obvious that the acceleration of the gifted pupils means a lower chronological high school entrance age for them, a lesser degree of capacity as compared with earlier groups and possibly a less thorough preparation, although this tendency may be more imaginary than real. With the earlier entrance of the gifted pupils and the increasing numbers of the less gifted, the high school is face to face with the problem of accepting lower standards of achievement for completion of high school courses, with the burden of an increasingly high percentage of elimination, or else with the problem of adjusting the difficulty of the work to the varying capacities of the pupils. As we are concerned here with the effect of these tendencies upon the elementary school, the discussion of the relation of quantitative measurements to the high school problems will be reserved for a later chapter.

Without doubt the newly developing high school problems have brought a reaction against rapid acceleration in the elementary school. Acceleration carried to the limit of grading pupils entirely on the basis of their mental ages, while providing common and definite grade standards, involves adjusting these standards to the capacities of the pupils of average mental ability. While such a procedure might pass the pupils along to the high school with a common equipment, this equipment would be totally inadequate to meet the former high school standards. To meet this situation it has been proposed that the elementary school curriculum be enriched to meet the needs of the gifted pupils and to keep them in the elementary school until they have the proper chronological as well as mental maturity and an adequate foundation in the elementary school curriculum. This proposal at once involves the question of grouping pupils in the elementary school on the bases of their capacities, attainments and tendencies to achieve. In the large city school grouping on the basis of these factors within the grade can be carried out with comparative ease. Whether such grouping be by classes or within the class, it seems to offer a solution to one set of perplexing problems while introducing another set. If the tendency to group into sections within a grade is thought of as involving an unsocial element, surely the grouping within a class, where each group is made to feel its relation to the others, is still more unsocial. When the sectioning is within the grade rather than within the class it may well be doubted that the less gifted pupil feels at any greater disadvantage either intellectually or socially than when he is the butt of a class intellectually.

Sectioning within a grade, however, carries with it a necessity for differentiation in the course of study—not necessarily a differentiation in the subjects studied but certainly a differentiation in the content of those subjects as far as the difficulty of the subject matter is concerned. Such a plan may provide for carrying all the pupils along through the elementary school at a fairly uniform rate regardless of their capacity to achieve or their attainment. It then implies their graduation from the elementary school with different achievement attainments. This again meets with the disapproval of the high school, for pupils must then be accepted with varying degrees of capacity and varying degrees of preparation for the work of the high school. This, however, is not a new situation, for graduation from the elementary school at the present time means anything but a uniform degree of attainment or of capacity. Moreover, the high school, with its varied elective program and with the quantitative information which the elementary school can furnish about each pupil, will be in a position to exercise more adequate educational and vocational guidance in assisting pupils to select their work than is now the case.

Classifying the Seventh-grade Pupils in a Large City Elementary School. The entering seventh-grade class of 111 pupils were given one of the Terman Group Tests of Mental Ability and an educational scale in spelling, reading, and both the information and thought phases of American history, geography and arithmetic just before their completion of the sixth grade. On the basis of the mental ages, intelligence quotients, achievement attainment and quality of work these 111 pupils were assigned to the four sections of the seventh grade in approximately equal numbers. The mental ages and intelligence quotients were taken in combination by selecting the pupils for the superior section, first of all, on the basis of what their mental age would be a year hence. This plan gives the pupils who will gain more rapidly in mental age—those with the higher intelligence quotients—more ground to cover than the less gifted pupils and at the same time keeps them from maintaining their lead in the group without working just as hard and just as efficiently as the less gifted. In order to obtain a preliminary classification, mental age limits were set for each section so that the entire group would be divided into four approximately equal parts. These limits are shown on Chart 4 by the dotted oblique lines. They fall so that section A contains the pupils who will be mentally 14 years 3 months or older when they complete the seventh grade, section B those who will be between 13 years 8 months and 14 years 3 months, section C those between 13 years and 13 years 8 months, while section D contains those who will be less than 13 years old mentally. As in Charts 1, 2, and 3, the numbers along the top and bottom of the chart indicate the mental ages as determined from the mental test. The numbers at the left and right sides of the chart indicate the chronological ages of the pupils at the time the tests were given. The placement of a pupil thus shows both his mental age and his chronological age, as it is determined by following down the column with his mental age at the top until one crosses the column with his chronological age at the left or right. The middle number in each placement square is the pupil's intelligence quotient, the lower number is his average grade variation; that is, the number of scale points by which, on the average, his scores in the scales vary from the sixth-grade achievement norms. For convenience in referring to the pupils each one is given a number. As these numbers begin in the upper left hand corner and follow consecutively across the chart and down it row by row they are easy to locate. For example, the pupil 30, whose placement is at the extreme right edge of the chart, has a mental age of 15 years 2 months, a chronological age of 11 years 8 months, an intelligence quotient of 130, and in achievement is 9 scale points or a year and a half above the sixth-grade achievement norm.

On the assumption that those who are chronologically older have been in school longer because their work has not been of as good a quality as those who are chronologically younger but of the same mental age, chronological age limits have also been set for each section. For the A section the limit was set arbitrarily at 12 years 6 months, as that seemed to best fit the distribution of cases; for the B section it was set at 13 years 6 months and for the C section at 14 years.

The fourth factor that needs to be taken into consideration is the actual achievement attainments of the pupils. In this element arbitrary limits were again set. For the A section the lower limit of achievement was set at the sixth-grade achievement norm, for the B section at a little less than one year or five scale points below the sixth-grade achievement norm, and for the C section at one and one third years or 8 scale points below the sixth-grade achievement norm. Until definite norms can be established and to some extent even then, section limits will have to be set up arbitrarily to fit the local situation with respect to these factors. At present communities differ widely in the mental ages and intelligence quotients of the children as well as in their achievement and quality of work.

For the A section the criteria are:

1. Location at the right of oblique line number 3, indicating a mental age of at least 14 years 3 months a year hence.
2. A chronological age not over 12 years 6 months.
3. An average achievement score not lower than the sixth-grade norm. These are indicated by a zero below the intelligence quotient in each placement or by a number with a + in front of it.

To indicate that pupils 1, 3, 4, 10, 11, 18, 29, 30, 34, 35, 49, 57, 63 and 64 satisfy all these conditions and hence are included in the A section, a circle has been drawn around their placements on the chart. But the A section is too small and there are others who satisfy the first three conditions and nearly satisfy the fourth condition. The mental age, intelligence quotient and chronological age conditions are satisfied by cases 6, 7, 45, 55, and 59, while the achievement standard is very nearly attained in all these cases except 6, where the other factors weigh very heavily. All the other cases at the right of oblique line 3 signally fail to satisfy either the achievement conditions, as in cases 23, 41, 58, and 70, or the chronological age condition indicating a questionable quality of work, as in cases 81, 84, 85, 86, and 101. But there are cases to the left of oblique line 3 which satisfy both the chronological age condition and the achievement condition and at the same time very nearly satisfy the mental age and intelligence quotient conditions. Such cases are those numbered 9, 14, 17, 32, 33, 39, 43, 44, and 62, which also have circles around them to show that they have been included in the A section. Cases 39 and 43 and especially case 14 are experimental suggestions. Either the mental test has indicated too low a mental age, in which case an individual mental test would be likely to detect the error, or else the pupil has attained his achievement rating through an unusual quality of work and effective habits of study. Either alternative makes it seem advisable to suggest that pupil 14 be placed in the A section for trial. With the exception of pupil 14, no one has been advanced to the A section who does not at least meet all the criteria for the B section as well as nearly meeting those for the A section.

Natural questions to arise at this point are "Would not some one else have made a somewhat different selection of pupils for the A section?" or "Would not another independent series of tests have led to a somewhat different selection?" The answer to each question is yes, for there can be no sharp, clear-cut demarcation between the A and the B sections, especially where the two join together. There is, however, comparatively little danger of getting the A pupils in a C section and practically no danger of getting them in a D section.

In applying the chronological age criterion, a question is likely to arise as to whether one may not occasionally find a pupil chronologically old and at the same time mentally mature, or with an excellent achievement record. The combination of the first two factors does happen, but seldom in conjunction with the third one. Proper consideration should, of course, be given to such combinations of factors when they do occur in order that misadjustment may be reduced to a minimum.

The criteria set up for the B section are:

1. The placement shall lie to the right of oblique line 2, which indicates that the pupils will be mentally between 13 years 8 months and 14 years 3 months a year hence.
2. The chronological age shall not be over 13 years 6 months.

3. The average achievement record shall not be less than —5, which indicates that the achievement must be slightly above the fifth-grade standard.

Pupils 5, 12, 15, 16, 22, 24, 28, 41, 48, 70, 78, 79, 81, 84, 85 and 86, whose placements have a ⌒ above them are included in the B section. Pupil 5 is an illustration of a border line case. His mental age and intelligence quotient would clearly place him in the A section. His achievement record alone holds him back. In all probability he would do as well as several of the other pupils assigned to the A section and will probably make the A section half a year hence. He is assigned to the B section primarily to call attention to two conditions: first, to the possible consequences of allowing the brighter pupils to fall significantly below their mental capacity in achievement, and second, to the problem as to whether capacity or achievement should be the determining factor in the classification of such border line cases, a problem that can be scientifically settled only on the basis of detailed observations and experimentation.

Pupils 23 and 58, two girls chronologically 11 years 6 months and 12 years 3 months, and mentally 13 years 5 months and 13 years 4 months respectively, have also been kept out of the A section because of their low achievement records. They were, however, suggested for the B section even though their achievement attainments will be the lowest in the group. While an investigation of their individual record cards, which should be consulted in all questionable cases, shows that they were doing a very poor quality of work in everything except the fundamental operations of arithmetic, it also indicates that the girls came from the class having the lowest class achievement scores of the four sixth-grade classes. Had these girls been in another class they might have even qualified for the A section, but their present attainments would probably leave them hopelessly in the rear were they placed in it. The fact that these girls need to fall back into the B section may be quite as much the responsibility of the school or of the supervisor in not keeping their sixth-grade class working along evenly with the others, as it is of the pupils themselves. No better illustration could be desired of a need for expert supervision, involving a thorough-going use of mental and educational measurements, than the educational predicament of these two girls.

There are five cases between the oblique lines 2 and 3, who are less than 13 years 6 months old but who fail to meet the achievement criterion alone. Of these, pupil 25, another girl coming from the poor class has an excellent record in reading and a fair record in at least one phase of history, geography and arithmetic. These two features together seem to warrant her retention in the B section. Pupil 40, a boy, with an achievement record similar to 25, is also retained in the B section in spite of his achievement disqualification. The other three cases can not be disposed of in the same way, as they stand very low in all phases of the content subjects. Pupil 8 even came from the sixth-grade class which made the best showing of the four classes, while the other two pupils—13 and 69—came from the class lowest in achievement.

Of the eight cases with chronological ages above 13 years 6 months, two—94 and 99—exceed the limit by not over six months, and at the same time have achievement records that would place them well within the limits of the B section. Seven more cases have been included in the B section to bring it up to a reasonable size. These seven cases, 26, 38, 51, 71, 72, 74, and 75, have all been selected because their achievement records, especially in reading and in the content subjects of history and geography, are well within the limits set for the B section. The actual extent to which the lower limit set up for mental ages can be safely disregarded in the cases of pupils having high achievement records, has not been determined experimentally, but it seems wiser to follow the attitudes of teachers and allow favorable achievement records to play a reasonable part in pupil classification until the results of both plans—classification primarily on the basis of mental age and intelligence quotients and classification primarily on the basis of school achievement—can be determined experimentally.

The criteria for the C section are:

1. Pupils shall be between the mental ages of 13 and 13 years 8 months a year hence. They are the ones whose placements lie between the oblique lines 1 and 2.

2. The upper chronological age limit is set at 14.
3. The average achievement variation should not be lower than a —8, which is a year and a third below the sixth-grade standard.

This group contains pupils numbered 8, 13, 20, 21, 27, 53, 54, 66, 69, 73, 77, 87, 92, 97, and 98, around whose placements a ◇ has been drawn to indicate their assignment to section C. What other pupils should be selected to bring the section up to a reasonable number? First of all, there is a group of pupils who are mentally old enough and chronologically young enough to belong to this group, but whose achievement records lie slightly below the lower limit of —8. They are pupils 19, 60, 65, and 83. Then there are several pupils—101, 103, 104, 106, and 108 whose chronological ages lie somewhat above the limit, but whose mental ages and achievement records lie within the limits. Other additional cases to make up a reasonable number for the section have been selected from those pupils whose mental ages fall short of the limit but whose achievement records lie within it or just below it. They are pupils 47, 67, and 93.

The remaining pupils make up the D section. All of them fail seriously in one criterion—the achievement standard—or else fail to meet more than the mental age and intelligence quotient standards set up for the C section. A few come within the mental age and intelligence quotient limits but fail in being chronologically young enough and in having sufficiently high average achievement records to place them in the C group. Many come within the chronological age limit but fail in all other respects. Like the pupils in the C section, the pupils in the D section vary widely in chronological age. It is made up in part of the mentally backward pupils whose achievement records are characteristic of their mental age rather than of their grade. It also contains a group of pupils who in mental age and achievement attainments are similar to the group just mentioned—but who differ from them in being chronologically from a year to a year and a half younger. This group consists of the pupils who are not only chronologically somewhat young for the sixth grade but also mentally too young by about a year.

In addition, the pupils in this group are not only not doing sixth-grade work but in some cases falling considerably short of their mental age norms. Pupils 2 and 36 are illustrations. Pupil 2 is chronologically only 10 years 6 months, mentally only 11 years 6 months, and is doing only third- or fourth-grade work. Pupil 36 is chronologically older but still only 11 years 10 months, mentally only 11 years 6 months, and achieving less than a normal third-grade pupil.

Adjustments in a Classification Are Occasionally Advisable. When a classification has been carefully worked out on the basis of the four principles employed,—mental age, rate of gain in mental age, actual achievement, and quality of work—several questions inevitably arise. Will not further adjustments need to be made at the end of the seventh grade? Owing to the fact that the pupils gain in mental age at different rates and also owing to the fact that pupils change in their quality of work, some changes will undoubtedly be found necessary. Changes may even need to be made from section to section before the year is half over in order to make adjustments for changes in quality of work, especially in the case of pupils coming from the poorer schools. Care needs to be taken, however, that such changes are not made merely on the basis of the pupil's appearance, his tactfulness, or his persuasiveness.

Will it be advisable to adhere strictly to such a classification in the face of other considerations? Obviously the insistance of teachers that a certain pupil should be put into another division because of marked differences in language habits, habits of cleanliness and the like should not be ignored. It may also be advisable to give the boy or girl with a high intelligence quotient who has been doing a poor quality of work a trial opportunity of working in the section with pupils of the same mental age. But if a more scientific classification than is usually to be found is thus to be allowed to give way before such considerations, why make it at all? In the first place, such considerations, and others similar in nature, are likely to affect but a comparatively small proportion of the group. In the second place, the effect of making such changes may be carefully watched and the advisability of making them in future cases determined experimentally.

Greater Homogeneity in Classes Results from a More Scientific Classification of Pupils. With the pupils distributed in sections according to the principles which have been employed, it will be interesting to note the changes that occur in the distributions of scores. In Plate 47 are given the distribution of the same scores as were given in Plate 33. In Plate 33, page 70, the distributions were given for the pupils in the several sixth-grade classes in the four different schools just as they were found in these classes. In Plate 47, on the other hand, the distributions are given for the four new sections of the same pupils when classified for the beginning seventh grade on the basis of the four principles previously discussed instead of on the basis of alphabetical groupings or on the basis of the teachers' judgments. The four new sections differ from each other in mid mental ages from six to nine months, with the smaller difference of six months between the B and C sections, as would be expected. In every case except two the mid achievement score differences are in the same direction as the mid mental age differences; that is, with only two exceptions, the mid achievement scores of the A section stand above those of the B section, those of the B section stand above those of the C section, and those of the C section stand above those of the D section. In most cases—17 out of 24—the differences between the achievement mid scores is greater even than the differences between the mid mental age. In the thought phase of geography the mid scores of the C and D sections are almost identical while in the fundamental operations of arithmetic the mid scores of the B and C sections are identical. That there should be only two cases of this type out of 24 is surprising when one considers the variation in emphasis upon the different phases of school work from school to school, as was evident from Plate 33. Owing in part to this variability in emphasis, as well as to the variability in quality of teaching, variability in the quality of the pupils' work, variability in interests, and possibly variability in specialized capacities, there is still a large amount of overlapping from section to section.

The overlapping in the case of the mental ages could readily have been avoided by grouping the pupils on the basis of mental ages alone, but this would have resulted in a much greater amount of overlapping in the achievement scores. Similarity in attainment in the various phases of instruction and in habits of work are quite as important as similarity in capacity in securing better instructional conditions in a class. To secure this feature, homogeneity in mental age must needs be sacrificed to some extent. However, in spite of this adjustment of pupils to common working groups on the basis of achievement and quality of work as well as capacity, no pupil of the A section has a mental age as low as the mid mental age of the D section, and only one has a mental age below the mid mental age of the C section. Furthermore, no pupil of the D section has a mental age as high as the mid mental age of the B section or even more than a month higher than the mid mental age of the C section. The overlapping of the A and D sections as wholes is confined to a single pupil. In achievement the overlappings are somewhat greater, but in the cases of reading and the thought phase of American history the overlappings are but little greater. In all cases the ranges of the sections are very much less than they would have been had the pupils been grouped as they usually are in schools. In some phases of instruction the range of scores is cut down to two thirds or even less than two thirds of the total range of scores. More adequate supervision of the schools from which these pupils came would undoubtedly have still further reduced the ranges of scores within each section and improved the conditions of instruction.

While the mid mental ages of the A and D sections differ by nearly two grades—the A section being nearly a seventh-grade group or a beginning eighth-grade group in mental age while the D section is only a fifth-grade group—the achievement mid scores of these two sections differ by just about as much in spelling and the thought phase of geography. In the information and thought phases of history, in the information phase of geography and in the fundamental operations of arithmetic they differ by at least two and a half grades, while in reading and arithmetic problems they differ by three grades or more. If there is any validity in the arguments that pupils can be more efficiently taught when grouped into grades in schools than when they are grouped according to chronological age alone, then the same arguments hold equally true for a more accurate grouping on the basis of mental age, rate of gain in mental age, achievement, and quality of work.

Should a Common Standard of Attainment Be Made the Basis of a Grade Designation? If these pupils with fifth-grade mental ages and fifth-grade achievement records are to be grouped together as a more homogeneous working unit, then should they not be designated as fifth-grade pupils? To attain the same achievement records as the average eighth-grade pupils they will surely need at least three more years in school and probably still more. Likewise, should not those pupils who are almost old enough mentally to begin the eighth grade and who have seventh-grade achievement records be at once promoted to the eighth grade? In all probability they will, if taught as a homogeneous working unit, attain the achievement norms of the average eighth-grade pupil at the end of a year's work. To neither question, however, can the answer, yes, be made. In the first place the achievement norms for the average eighth-grade pupils are only an arbitrary breaking off point for the end of the elementary school. They are what they are, not because these amounts of information and ability have been found to be the amounts necessary for success either in high school or in life, but simply because they are the amounts of information and abilities that average pupils acquire by the time they are fourteen and a half years old and have been in school eight years. It is very doubtful, indeed, that pupils with lower rates of achievement, as indicated by lower intelligence quotients should be retained in the elementary school until they have attained these arbitrary standards set up by the average eighth-grade pupil. These pupils belong in a group together because they can probably be best taught together and not because they need to stay three years longer in the elementary school. In the same way the arbitrary standards of attainment of average eighth-grade pupils can hardly be accepted as the goal of the brighter pupils. These amounts of information and abilities may be adequate for the brighter pupils. If so, they should be promoted as rapidly as they attain them. On the other hand, these brighter pupils, because of their greater capacities, will have wider and deeper interests than either the less gifted or average pupils, and hence may need greater ranges of information and higher ranges of ability in the elementary school subjects. If so, these pupils may need two more years of elementary school work but they do not need to be held back at the pace of the slower or even average pupils. While achievement surveys can not determine standards of achievement for pupils of different degrees of capacity on the basis of social and individual needs, they do indicate the amounts of information and abilities now being acquired in the elementary school subjects by pupils of differing amounts of capacity for school achievement. In this way they lay a basis for an experimental determination of the amounts of the various abilities which are actually needed by individuals of varying degrees of intelligence.

CHAPTER XII

CLASSIFYING THE STUDENTS IN A JUNIOR HIGH SCHOOL

In some respects the problem of grouping students in the junior high school is identical with that of classifying the pupils in an elementary school. They are, of course, more likely to come from several different schools. Then, too, enrichment of the curriculum rather than acceleration of the superior pupils seems to be the dominant trend in the junior high school. In both the selection and classification of students these features have to be kept in mind. Enrichment of the curriculum, however, may mean any one of several different tendencies. The program may be made more varied in character. Election of courses may even be provided, as in the four year high school. Furthermore, there may be differentiation in the program to meet the interests of students, especially the vocational interests. Again, there may be a differentiation in content to fit the capacities of the students. For differentiation in either the program or the content to be successful some means of adjusting the proper program to the student must be devised. Indeed, the very purpose of the junior high school requires a classification of the students on the basis of their capacity to learn, their normal rate of achievement, their adequacy of preparation and their habits of work and methods of study.

The Students Entering a Junior High School May Be Expected to Differ Widely from One Another in Several Important Respects. A glance at Chart 5, on which the placements of 137 students entering the same junior high school are located, shows that the pupils range in chronological age from less than 11 years to more than 14 years. More than ten per cent lie outside of these chronological age limits. In mental ages the range is wider than from 11 years 6 months to 15 years 6 months, as five per cent lie even outside this range of four years.

At the bottom of the chart are a number of pupils with intelligence quotients around 80 or below while in the upper right hand corner are several pupils with intelligence quotients above 140. In average achievement attainment the range is quite as wide: more than 4 per cent of the pupils had average achievement records no higher than that of an average pupil half way through the fifth grade, while nearly 11 per cent had average achievement records as high as the average pupil half way through the eighth grade. With variations greater than three years in chronological age, four grades in mental age, three grades in average achievement attainment and 60 points in intelligence quotients, and with many combinations of widely varying amounts of these factors, the task of making an adequate classification of these students for instructional purposes is by no means a simple one, yet its necessity is apparent.

The Need for an Adequate Classification of Students Is Even Greater in a Junior High School than in a Large Elementary School. A comparison of Chart 5 with Chart 4 shows a markedly closer clustering of chronological ages and a considerably greater variability of mental ages on Chart 5. In the promotion of the pupils to the seventh grade in the large elementary school similarity in mental age played a much more prominent part than similarity in chronological age (Chart 4). Just the opposite tendency is true in the case of promotions from the several elementary schools to the junior high school (Chart 5). This, of course, is not surprising but it makes the problem of classification in the junior high school a somewhat more complicated one and also contributes to the necessity for making an adequate classification of the students. At the same time it points out the need for more adequate inter-school supervision or else for some definite bases of promotion from elementary schools to a junior high school.

Grouping the pupils alphabetically may embody the spirit of impartiality but its effect upon the instructional conditions in a class are highly detrimental to effective teaching. The range of mental ages, intelligence quotients and achievements of the pupils in an alphabetically selected group would be even wider than in the usual elementary school class.

To keep the pupils in the same groups in which they came from the elementary school, if it could be done, would deprive the junior high school of some of its most important functions. But fortunately it cannot be done as some groups would have to be broken up and scattered among others to bring the junior high school classes up to the average size. Grouping pupils on the basis of the judgments of their previous teachers is a method that has more recently come into vogue. The fact that it results in a marked improvement over the other two methods in reducing the variability of pupils in the newly formed classes accounts for its popularity. Two serious faults, however, detract from its value. It is too dependent upon teachers' subjective judgments, with all their probability of error, to be used exclusively, especially when objective measurements of the desired traits are readily obtainable. At the same time the ranges of ability differ so markedly from school to school in different sections of the same community that the average pupils in any group in one school may be equal to the brightest pupils in the corresponding group in another school. Furthermore, no provisions are made for making adjustments to overcome differences in standards of achievement or variations in point of emphasis from school to school. In the more recent attempts at classifying pupils tests of general mental ability have come to play a larger and larger part. In so far as these tests are adequate measures of the kind of intelligence that is involved in school work and in so far as this is an important factor in indicating what a pupil is able to achieve in each of the various phases of school work, they eliminate the deficiencies of teachers' judgments as a basis of classification. These tests in combination with achievement tests for which mental ability test norms have been worked out, furnish a still more adequate basis of classification and for educational guidance.

Pupils Varying Widely in Different Traits May Be Grouped into Fairly Homogeneous Units. Just how much may be accomplished in grouping pupils varying as widely as those whose records appear on Chart 5 will be clear from the following description.

In the superior or A section are included the pupils

1. Who will be mentally at least 14 years 8 months at the end of the seventh grade.
2. Who are chronologically not over 11 years 8 months.
3. Whose average achievement is at least 3 points or half a year in advance of the sixth-grade achievement norms.

These limits include pupils 1, 5, 8, 16, 17, 21, 25, 26, 30, 31, 38, 39, 40, 45, 46, 53, 54, 55, 59 and 60, who have a ○ around their placement. Of this group pupil 5 is considered misplaced by her teachers. To them she seems babyish and immature. This suggests that pupils below 11 years of age chronologically should probably not be promoted until their placements fall near the continuous oblique line number 5. Pupils 16, 21, 30, 31, and 38, although just on the border line of achievement, are considered by their teachers to be well placed and to be very rapidly improving in spite of the handicap of a less adequate preparation than that of most of the pupils of the section. There are several pupils who fall outside the chronological age limit but who nevertheless satisfy all the other requirements. These are pupils 65, 66, 67, 75, 83, 84, 85, 98, and 105, who, with not more than two exceptions—pupils 98 and 105—should have been sent on to the junior high school at least a year earlier. They are mentally very much overage for junior high school entrance. Three of them are better than average eighth-grade pupils in achievement and four more are considerably better than average seventh-grade pupils at the end of the grade. While pupil 98, who has been in the United States only two years, is working above the average in the superior section, pupil 105 is in danger of failing. In the opinion of his teachers, he is lazy. He should undoubtedly have been held to better work in the elementary school, promoted earlier to the junior high school, and placed in the next lower section. Pupil 47, with a mental age of nearly 15 and an intelligence quotient of 129, could not reasonably be put back in a lower section even though the quality of his work is very low and his achievement status not quite up to the arbitrary standard set for the A section. The teachers who have this section do not find him misplaced but in spite of earnest work he has some difficulty in keeping up with the average work of the class on account of his lower achievement status. Absence on account of illness seems to explain his low achievement status as well as an apparently poor quality of previous work. The five pupils—29, 74, 82, 87, and 94—with the ⌒ above their placement, either fall below the achievement standard or outside the chronological age limit without any compensating advantage. In their place three pupils were selected who fell within the chronological age limit and only slightly below the mental age limit but who are significantly advanced in achievement. These pupils—37, 44, and 51—with circles around their placements to indicate that they are included in the A section, are considered by the teachers to be satisfactorily placed, as are also pupils 73 and 109. Although somewhat outside the chronological age limit and just on the mental age line, their achievement records of +8 and +10.3 indicate a quality of work that warrants placing them in the A section, in spite of their lower mental ages and lower intelligence quotients. Superiority in achievement and in quality of work seem to be quite as valid principles of classification as mental age. Earlier promotion to the junior high school would, of course, have placed all five of these pupils in the B section half a year younger and given them greater chances of leading in this section than they now have in the A section. With their late promotion, however, their superiority in both mental age and achievement would tend to make them misfits in the B section.

For the B section the following criteria were set up:

1. A mental age of at least 14 years at the end of the seventh grade. This includes all pupils to the right of oblique line number 2.
2. A chronological age of not over 13 years 2 months.
3. An average achievement record equal to normal sixth-grade work or better. This is indicated by a 0 or a number preceded by a + at the bottom of each placement.

Each of these criteria are at least half a grade lower than those for the A section. Owing to the higher mental ages and higher average achievement records than those on Chart 4 for the large elementary school, the limits for the B section in the junior high school correspond fairly closely with those for the A section in the large elementary school. Similar differences may well be expected from one junior high school to another. Hence the criteria for sectioning the group must be set up to meet the conditions found in the entering classes of each junior high school.

Within the limits set up for the B section are included pupils 4, 7, 12, 14, 15, 23, 29, 35, 36, 43, 52, 57, 64, 72, 79, 82 and 87 who have a ⌒ above their placements. Three pupils—93, 100, and 103—are chronologically older than 12 years 2 months but meet all the other requirements, including an average quality of work. Pupils 94, 115 and 117 are put into this section because they meet all requirements except the chronological age limitation and quality of work, and at the same time seem less misfits in the B section than in the next lower section. The first two are considered by their teachers to be doing as well as the average pupils in the section. Pupil 117, however, is considered slow by one teacher, careless in his work by a second teacher and doing splendid work by a third teacher. Evidently his efforts are dependent upon his attitude toward the teacher or else the teacher's rating of his achievement and progress are affected by some element in his make up that impresses each of his teachers differently. In addition to these twenty-two pupils, the B section is made up of two other groups of pupils. One of these groups includes the pupils who meet all the requirements except the achievement attainment standards, and an average quality of work. The failure of any pupil mentally 12 years 6 months or above to attain the sixth-grade achievement norms implies a quality of work below the average, of course. This group comprises pupils 11, 24, 58, 74 and 78, who also have a ⌒ above their placements. Of these, the first two are doing as well as the average pupils in the class. The other three pupils, whose work was of a poor quality in the elementary schools from which they came, are also found by their present teachers to be failing in applying themselves to their work. Thus, a poor quality of work in the elementary school seems to be predictive of inefficient work in the junior high school also. At first thought it might seem that these pupils ought to be placed in the lower group with pupils of similar achievement in spite of their advanced mental age. It would seem wiser, however, unless they are too far behind the others of their own mental age in achievement and are also satisfied with too poor a quality of work, to place them in a section with pupils of about their own capacity and to warn their teachers that they may need more stimulation and unusually careful attention to their methods of study and habits of work.

Of the second group, consisting of pupils 3, 28, 49, 63, 71, and 112, all but two meet all the requirements except the mental-age criterion but compensate for this in high achievement records and an excellent quality of work. Pupil 3, who comes so near to meeting the achievement, mental age, and quality of work requirements in spite of his very low chronological age, is, as a consequence of these conditions, placed in the B section, where he is doing excellent work. Pupil 112 is an example of a boy who has been retained in the elementary school until his achievement record is too high to place him in the C group yet whose mental age and intelligence quotient make it extremely difficult for him to make reasonable progress in the B section. In spite of his high achievement record and the excellent quality of his work, he is one of the few pupils whom his teachers consider misplaced. As a whole, the class is considered an unusually homogeneous working unit and to be doing an excellent quality of work.

The students to be included in the C section are those

1. Who will be at least 13 years 6 months old mentally a year hence, whose placements are at the right of the broken oblique line 3.
2. Who are not over 12 years 8 months chronologically.
3. Whose average achievement records are not more than 3 points or half a grade below the sixth-grade norms.

Within these limits pupils 6, 9, 10, 13, 22, 33, 34, 41, 42, 48, 70, 80, 81, 89, 90, 91, 97, and 108 are found. To differentiate them from the pupils in the other sections a ◇ has been drawn around the placement of each one in the C section. Pupil 115 falls so slightly outside the chronological age limit as to make his inclusion unquestioned. With pupil 132 the case is somewhat different. Here again is a boy whose earlier promotion from the elementary school would have placed him with pupils like himself in practically every respect. He is, however, too far beyond the pupils of the D group in both mental age and achievement attainments to justify placing him in the D section, yet he is also a misfit in the C section. He will find it difficult to work comfortably with the younger pupils of higher rates of achievement. Just as in each of the other sections, so in this one there is included a group of pupils who meet all the other requirements except achievement attainments, yet whose younger chronological age, higher mental age, and more rapid rate of mental development practically precludes their being placed in the D section. Such cases are pupils 2, 19, 20, 27, 50, 56, and 77. Pupil 104, with a mental age that would place her in the B section, has a very low achievement record and a poor quality of work. Her mental age seems too high to justify placing her in the D section. She was finally placed on trial in the C section but her teachers report that she is putting no effort into her work and is bound to fail. Pupils 107 and 125, on the other hand, do not fail seriously enough in any requirement to make their assignment to the C section seem at all questionable. There is also a small group of pupils—18, 32, 61, and 62—whose mental ages are somewhat below the standard set for the C group. Their low chronological ages, coupled with reasonable achievement attainments for pupils of their mental ages, and at least an average quality of work, make their inclusion in the D group seem unwarrantable. An additional half year in the elementary school would have comfortably placed these pupils in the C group in both mental age and achievement. Pupil 69 is so near the mental-age standard and stands so high in achievement as well as in quality of work that there can be no question about placing her in the C section. Some of her present teachers even advise her promotion to the B section on account of the excellent quality of her work. The two pupils who differ so markedly from each other in average achievement—three years—and in quality of work, pupils 69 and 104, are striking examples of cases in which the use of mental tests alone for classification purposes would lead to serious displacements.

The D section, of course, is composed of the pupils not included in any one of the other three sections, or perhaps one should say, not included in the C section, as they differ too markedly even from the pupils in the B section to be confused with them. Whereas in the B section there are no pupils with intelligence quotients below 101, there are only two pupils in the D section with intelligence quotients above 101. Even in the C section there are only four pupils with intelligence quotients below 101.

A Few Comparisons Will Help Clarify the Four Principles Involved in the Classification of These Pupils into Their Respective Sections. Attention has already been called to the very slight amount of overlapping of sections D and B and even of sections D and C in the matter of intelligence quotients. There is likewise comparatively little overlapping in the case of sections C and A. In section C there are only three pupils—6, 9 and 20—who have intelligence quotients above 114, while in the A section there are only three pupils—73, 105 and 109—with intelligence quotients below 114. Little has been said regarding the intelligence quotient as a factor in the classification, but it is now evident that it has played a considerable part. The chronological age limits arbitrarily set for each section also set the lower intelligence quotient limit at the same time. What little overlapping there is to be found in the distributions of intelligence quotients is largely due to inclusion in the higher section of pupils with chronological or mental ages outside the arbitrary limits because of their high achievement records, or the exclusion from a higher section of pupils with comparatively low achievement records. Just how much weight should be given to the achievement records and the quality of work has not been definitely determined because of several complicating factors. In the first place there are some cases where low achievement records and poor quality of work have been a characteristic of the whole class from which the pupils were promoted. Such pupils may respond earnestly when placed in a section characteristic of their capacity rather than of their achievement and when better methods of study and more efficient habits of work are suggested. There are also pupils whose low achievement records and poor quality of work are due to aversions aroused by a previous teacher or some peculiar circumstances. In such cases, which are often characterized by fairly high intelligence quotients, a pupil will respond to an appreciation of his capacity. Occasionally a pupil may stand low in achievement and quality of work because of some special difficulty, such as unfamiliarity with the language in the case of recently arrived immigrants, or unusually inefficient reading habits. In a great many cases, however, the teachers in the junior high school find that the poor quality of work done in the elementary school is also predictive of a poor quality of work in the junior high school classes. In nearly all cases they find that the inadequate preparation indicated by a low achievement record constitutes a handicap. It must be kept in mind, however, that low marks or even failure in an elementary school class are not synonymous with a low achievement record. Occasionally a pupil who is timid, emotionally excitable, or has developed an aversion to a teacher or to school work in general, is found to have a much higher achievement record when it is objectively determined by educational tests than his school marks or grade location would indicate.

In the case of most pupils with achievement records significantly below what their mental ages would lead one to expect, a somewhat detailed examination of their previous records and environmental conditions should be made before their classification is finally decided upon. This should be done, not so much for the purpose of obtaining a more accurate classification but to furnish the teachers with a diagnosis of the actual status of each of the pupils, in order that proper remedial measures may be undertaken regardless of the section in which they may be placed. This, of course, implies that there should be an elasticity in the sectioning program that will allow of a pupil being transferred from one section to another in case he is found to be a misfit by having been placed in too high or too low a section.

A very different situation is found in the case of pupils whose elementary school work has been characterized by an unusually excellent quality. With relatively few exceptions these pupils have been found by the junior high school teachers to be well classified for work as well as in achievement when they have been placed in the next higher section to that in which their mental age would normally locate them.

The familiar argument against the rapid promotion of the brighter pupils in the elementary school—that the younger pupils are thrown into contact with those who are chronologically older, larger in stature, and motivated by different interests—will not hold true in the junior high school, where the brighter pupils may be carried along rapidly as a unit. As a matter of fact, a chronological age classification on the basis of probable achievement during the next grade brings the older but less gifted pupils together as a single working unit, and also assembles the younger, brighter pupils in a separate functioning unit. So marked is this differentiation between the sections of the junior high school class taken as an illustration, that while there are only three pupils with a chronological age above 12 years in the A section, there are only two pupils less than 12 years old in the D section. In achievement attainments there is no overlapping or even an approximation to it between the D and A sections, and almost none in the case of the D and B sections or the C and A sections. Although there can be no sharply drawn distinction between contiguous sections, the differentiation becomes almost absolute between the extreme sections, as well as very marked between the sections separated by an intermediate section.

From an instructional point of view, the advantages of this method of classifying pupils are too obvious to need pointing out. For purposes of instruction the junior high school teachers consider the groupings almost ideal. From the standpoint of incentives to work and the development of proper social attitudes some of the teachers of the D section express a belief that the less gifted pupils are being placed in a position involving educational limitations as well as social inequality. The educational limitations seem to consist of a lack of inspiration furnished by the presence of brighter pupils in the class. This, however, is probably felt by the teachers rather than by the pupils. The teachers who have charge of the brighter groups or who teach both a less gifted and a bright section feel, on the contrary, that the less gifted pupils, when in a class with much brighter pupils, are overshadowed, unless special attention is given to them at the expense of the rest of the class. One teacher even expressed it as a crime to keep the less gifted pupils in a class with superior pupils, where they would have little or no chance for self-expression. It should not be overlooked that a more homogeneous grouping on the basis of probable future achievement gives the relatively brighter pupils in a less gifted section much greater opportunities for intellectual leadership and greater incentives to compete with the rest of the group than would be afforded them in a widely mixed class. Nor should the effect of the presence of the less capable pupils upon the superior pupils in the usual class be overlooked. In the usual class the gifted pupils are generally too few for them to be an inspiration to one another. Not only are they likely to get less attention than the rest of the class but the average achievement of the usual class is too low to challenge them to any vigorous efforts in studying.

A certain stigma is felt by the teachers of the D section to be attached to the pupils comprising it. That the less gifted pupils are made to feel socially more inferior when grouped together than when hopelessly trying to compete with brighter pupils is seriously to be doubted. At any rate, opportunities can be provided for the less gifted group to show their superiority in certain lines as a group. For example, in a class in sheet metal work the boys of the D section in this junior high school are doing a very much better quality of work than those of the A section. Wherever the less gifted pupils are found to be doing a superior quality of work, this may be utilized to offset any stigma that may be attached to being in the D section, even though such a stigma is not likely to be any greater than is usually placed upon the dull pupils in a widely mixed class. Nor is it at all necessary to make the labels indicative of the nature of the students comprising a class. Furthermore, while the measurements should be at all times available to the teachers, they should be treated in the same manner that a physician treats the diagnoses of his patients. They are neither for public display nor public discussion, but are to be used for the best interests of the individual pupil.

CHAPTER XIII

JUNIOR HIGH SCHOOL ENTRANCE CONDITIONS

The phrase "Entrance requirements" in connection with the junior high school may seem distasteful and foreboding. It suggests the rigidity and artificiality connected with the usual type of entrance examinations. So little has been said about entrance conditions for the junior high school that the institution may seem providentially free of them. Yet entrance conditions it surely has, nor need their recognition and formulation lead to formal or inflexible standards. Completion of the sixth grade seems quite as essential for entrance into the junior high school as graduation from the eighth grade does for entrance into the four-year high school. Yet completion of the sixth grade may mean variations in chronological ages from below 11 to above 14. Children with the same chronological age may be sent to the junior high school varying from 12 years to 16 years in mental age and at the same time differing in achievement attainment by three or more grades. Pupil 19 in Chart 5, page 162, was sent to the junior high school when he was only 11 years 2 months old chronologically and only half way through the fifth grade in achievement. Pupil 67 was kept in the sixth grade until he was 11 years 8 months old chronologically even though he was mentally 3 years 4 months older than pupil 19 and more than three and a half years in advance of him in achievement. Pupil 109 was kept in the sixth grade until he was mentally 13 years 7 months old, chronologically 12 years 8 months old and had the achievement record of an average pupil half way through the eighth grade. These entrance conditions are highly elastic and lacking in rigidity but they are wanting also in common sense and reasonableness. Of course, the excuse may be given that these pupils came from different schools and that the teachers and principals did not realize that such wide differences were existent. Both are true, too. But the condition needs to be foreseen and also forestalled, nevertheless.

One of the important problems challenging the junior high school principal and his staff of teachers is that of determining at what varying quantitative levels of achievement pupils of different degrees of capacity should enter the junior high school. Some may take the view that the junior high school has no part to play in setting any standards of admission; that it must receive whomever the elementary schools choose to send to it and at whatever level of achievement they may have attained. While this may be true in a sense, nevertheless the junior high school can go a long way toward establishing reasonable standards of attainment for pupils differing in their capacities for achievement. This may be accomplished by merely suggesting for the guidance of the elementary school principals what varying quantitative levels of attainment or preparation are considered by the junior high school faculty as desirable for pupils of different degrees of mental capacity. Nor will elementary school principals be averse to such suggestions. On the contrary, they are quite as desirous as the junior high school faculty of having some definite measures of capacity and achievement as standards for promotion to the junior high school. Without any such standards each elementary school principal is left to his own judgment and discretion as to when each pupil should be sent on. Completion of the sixth grade does not in itself possess any definiteness as a standard, as the achievements of sixth-grade pupils in any class differ widely from one pupil to another and even the mid achievement scores show marked differences from the sixth grade class in one school to that of another school.

Standards for Promotion to the Same Junior High School Vary Widely from One Elementary School to Another. As an example of the wide differences in achievement that may be expected from school to school, Table 17 represents the mid scores in several phases of school achievement in the sixth grade classes of the five elementary schools sending pupils to the same junior high school. In spelling these mid scores range from 51 to 59, a difference of two years. The difference of six points between the highest and lowest mid score in reading is equivalent to a year and a half. Still wider differences are found in the information phase of American history, where the mid scores range from 55 to 77, a difference of 22 scale points or more than

TABLE 17.

Mid Scores and Grade Variations for the Sixth Grade Class in Each of the Five Elementary Schools Sending Pupils to the Same Junior High School.

School	Spelling *	Reading *	History Information	History Thought	Geography Information	Geography Thought	Arithmetic Fundamentals	Arithmetic Problems
S	51	52	65	77	76	73	78	66
	—1½	+3	—9	+3	+2	—1	+4	0
T	58	51½	60	71	66	68	79	64
	+9	+2	—14	—3	—8	—6	+5	—2
U	57	54	77	79	83	72	82	74
	+7½	+6	+3	+5	+9	—2	+8	+8
V	54½	50	55	71	68	69	78	63
	+3½	0	—19	—3	—6	—5	+4	—3
W	59	48	63	78	74	69	81	70
	+10½	—3	—11	+4	0	—5	+7	+4

* In spelling and reading a variation of 4 points is equivalent to a year's work. In the other phases of instruction a variation of 6 points is equivalent to a year's work. The + indicates that the class median is above the grade norm, the — that it is below the grade norm.

three and a half years. The thought phase of history shows a difference of only eight points, but this is equivalent to more than a year's work in school. In the information phase of geography the range is wide again, extending from 66 to 83, a difference equivalent to nearly three years. A difference of less than a year between the extreme mid scores is to be found only in the thought phase of geography and in the fundamental operations of arithmetic. In arithmetic problems the difference rises again to nearly two years. Even the average difference between the mid scores of school T and those of school U is 7½ scale points, a difference equivalent to a year and a quarter, while the average difference between the mid scores of school U and those of school V is 9 scale points, which is equal to a difference of a grade and a half in school work. The average of the variations from the sixth-grade norms for school V, as indicated by the line of small numbers just below the line of mid scores, shows that the class is hardly half way through the fifth grade in achievement while the average of the variations from the sixth-grade norms for school U shows that this class is very nearly a seventh grade in achievement. Surely such wide differences in class achievements as these call for some common standards for promotion to the junior high school. Yet the differences among the achievement records of the individual pupils are, of course, very much greater still.

As one glances down the rows of variations from the sixth-grade norms, he is struck not only with the variability of emphasis which a subject or phase of school work receives from school to school but also with the variability of emphasis from one phase of school work to another. Not only are different amounts of emphasis given to spelling in the several schools and likewise to the information phase of American history, but the emphasis on spelling is all out of proportion to the emphasis on the information phase of history in all the schools except school U. Again, considerably more emphasis is given to the fundamental operations of arithmetic than to the thought phase of geography in every school. In school U alone is there anything like an even amount of emphasis from each phase of school work to each other phase. Inequalities such as these are undoubtedly not desired by the principal and teachers of the elementary school. They are just as desirous of having definite, and reasonably attainable objectives to aim at as the junior high school staff can be desirous that they should achieve certain specific goals. Just what these objectives shall be will depend upon the mental age and intelligence quotient standards arbitrarily set up for junior high school admission and upon the amount that can reasonably be achieved up to that time by the pupils having these intelligence quotients and reaching these mental ages.

What Are Reasonable Qualifications for Promotion to the Junior High School? It is generally conceded that pupils between the chronological ages of 12 years and 12 years 6 months who are also between the mental ages of 12 years 6 months and 13 years, who have intelligence quotients around 100 or above, and who are up to grade or above in achievement, are proper subjects for promotion to the junior high school. But of the group of 137 pupils whose placements are given on Chart 5, there are less than half a dozen who could qualify. What variations from these tentative standards are permissible and even desirable? In the case of pupils who are chronologically older than 12 years 6 months it is rather a question of determining the conditions under which promotion should be encouraged.

That any pupil who has reached the age of 12 years 6 months should be sent on to the junior high school at the first regular promotion day after he has reached the mental age of 12 years, provided he has attained at least fifth-grade achievement, would seem desirable. If not promoted, he will be chronologically out of place in the elementary school. He can remain only by repeating the work of a grade of which he has been a member. His rate of achievement and, in all probability, the limit of his mental capacity are below normal. His deficiencies in achievement are more likely to be due to mental limitations or to inability to comprehend the work of the class than to any fault of his own. In the junior high school he can be placed with a group of pupils of about his own chronological and mental age, who have attained about the same degree of achievement, and who have somewhat the same interests and capacities for further achievement. Since the sixth-grade achievement standards have not been attained by members of this group the class work must be adjusted to their previous preparation and capacity for achievement. For pupils with intelligence quotients in the neighborhood of 90 or below, who become chronologically older than 12 years 6 months without reaching the mental age standard of 12 years, both the mental age and achievement attainment standards may well be lowered in order to admit them to junior high school classes devoted to vocational preparation and to cultural classes adapted to their social needs. From such classes they will undoubtedly derive far greater benefit than can be acquired by them from any further achievement they are likely to make in the elementary school.

It is also a questionable practice to retain a pupil in the six year elementary school after he has reached the chronological age of 12 years 6 months if his mental age will become 13 years before the next promotion date, even though he may fail to attain the fifth-grade achievement standards. Exceptions should, of course, be made to such a procedure in special cases where the intelligence quotient is well above 100 and the achievement attainments are low because of some unfortunate circumstances, such as illness, lack of efficient instruction, or language difficulties in the case of foreign-born children. The main purpose of making such exceptions is to better place these special cases with pupils of like rates of achievement, like interests, like preparation, and like prospects of achievement. Furthermore, just as the minimum mental age and achievement standards should be lowered for the pupils with intelligence quotients somewhat lower than the average, so the maximum mental age and achievement standards at which they should be required to be promoted should also be progressively lowered for the pupils gaining more slowly in mental age, in order that they may find in the junior high school work that is better adapted to their capacities and interests.

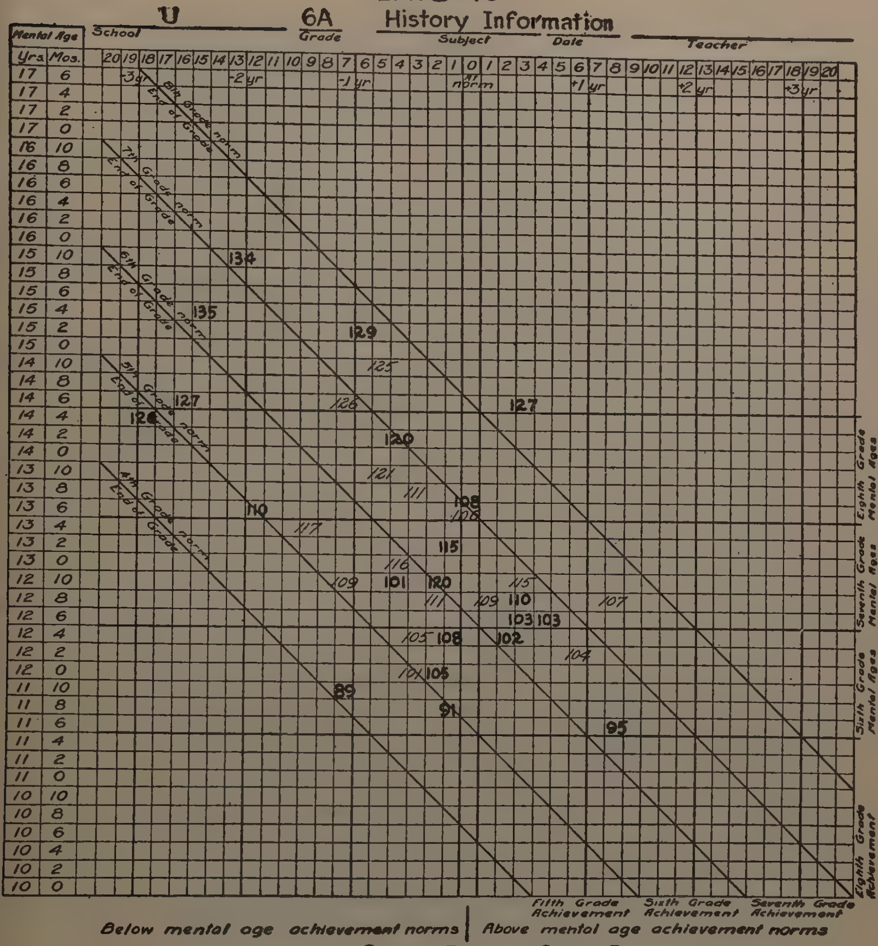
It is equally clear that the pupils who attain a mental age of 12 years 6 months may well be promoted before attaining a chronological age of 12 years provided they have attained the sixth-grade achievement standards. Too great a chronological immaturity, however, unless accompanied by an unusual mental maturity, is likely to place some very young pupils in groups of their own mental age but of much greater chronological age. It is doubtful whether a pupil should be promoted to the junior high school even at eleven unless he has reached a mental age of at least 12 years 9 months and a sixth-grade achievement record. On the other hand, it is probably just as important that pupils who reach the age of 11 years should not be retained in the elementary school beyond the mental age of 13 years 9 months unless they have deficient achievement records. Such deficiencies should, of course, be made a matter of careful investigation for the purpose of determining the conditions responsible for them—whether conditions of instruction, conditions of environment, physical conditions, or conditions of native endowment.

The Misfit Pupils in the Junior High School. On Chart 5 two continuous oblique lines have been drawn so as best to conform to the chronological and mental age conditions previously suggested, as well as to the general promotion tendency found in these schools. The continuous oblique line at the left—number 4—slanting toward the lower left hand corner—indicates the chronological and mental ages at which pupils may well be promoted unless deficient in achievement, while the second continuous oblique line designates the chronological and mental ages beyond which the pupils should not ordinarily be kept in the six grade elementary school except under exceptional circumstances. The difference of a whole year between the two lines affords a wide leeway in which to bring the achievement records of the inefficient pupils more nearly up to the norms. To promote pupils before they reach the ages—both chronological and mental—indicated by the first line, unless they have made superior achievement attainments, is bound to throw into the entering junior high school class a group of pupils who are chronologically too young to be placed with the less gifted but older pupils of the lowest section, and mentally too immature and too deficient in achievement attainments to be placed in a higher section with any expectation of their being able to hold their own in competition with the mentally older and better prepared pupils. They constitute a group who need to stay in the elementary school until they are ready to take their places with groups of pupils similar in all respects to themselves.

At the right of the second continuous oblique line is a group of pupils who are chronologically from about 11 years 6 months to 12 years of age. Mentally they range from 14 years to 16 years of age. In achievement most of them are from a year to two years in advance of the sixth-grade achievement norms. Practically all of these pupils could have been promoted to the junior high school a year earlier. In that case they would have found their places in the upper section of the entering class in both mental age and achievement, and would have been able to maintain their status quite as well as the pupils whose placements are now located in the vicinity of the second continuous oblique line. As it is, they will enter the senior high school a year later than they might well enter and will consequently enter the university and professional schools later also. To be sure, they will be mentally more mature on entering each new institution, and presumably will have a better foundation in the elementary school subjects of spelling, reading, American history, geography, and arithmetic. Two questions, however, engage our attention at this point. Will a year's additional achievement in the elementary school subjects, if attained, be of sufficient value to warrant holding these pupils back a full year? Just how far these brighter pupils should be carried in the elementary school subjects has not been determined nor is it even at all accurately known how far they are being carried. Of course, it might be proposed that the junior high school should carry them through the course of study at a more rapid pace. This might well be done if the best section of the class were a more homogeneous one but these few brilliant pupils are quite as much misfits in the brightest section of the entering class as the chronologically young and immature are misfits in the dullest section. They are already about a year in advance of the rest of the brightest section, and at the same time form too small a group for a separate section. Here the second question forces itself on our attention. Why not promote them at once to the brighter section of the beginning eighth grade? In both capacity and achievement here is where they would belong if the same type of pupils in the beginning eighth grade were promoted to the ninth, and the brightest pupils in the ninth grade in turn promoted at once to the senior high school. Two conditions, however, make such a course seem far less wise than a more rapid promotion in the elementary school. In the first place pupils brought together from several sixth-grade elementary schools into one big high school have to become adjusted to some very different environmental conditions. To be dropped part way along in the junior high school into a group of pupils who have already made the necessary adjustments, would place an added burden upon these pupils. It might seem that these brighter pupils should be able to make the adjustments correspondingly easier than the less gifted. Quite the opposite seems true when it comes to adjusting themselves to the pace set in the brighter section. In their elementary school classes these brighter pupils have been easily the leaders in school achievement, so easily the leaders in many cases that they have not been required to do work of an average quality to maintain the lead which their native endowment gave them at the start. When they enter the junior high school this tendency to fall below an average quality of work may become a serious handicap. In fact, practically every one of the junior high school teachers who had the superior section of the entering class found these pupils unusually capable in making brilliant extemporaneous recitations but equally incapable of sustained, arduous effort. It is this factor which makes their double promotion on entering the junior high school a questionable procedure. It is also the factor which makes their earlier entrance into the junior high school seem highly desirable, as this would require their more rapid promotion during their elementary school career and the consequent keener competition in achievement with pupils of more nearly their own mental capacity. The further retention in the elementary school of those pupils who are both chronologically and mentally immature as well as deficient in achievement and the more rapid promotion of those pupils who are mentally mature and in danger of deteriorating in the quality of their work would relieve the junior high school teachers of two unnecessarily perplexing problems.

Effective Supervision in the Elementary Schools Also Contributes to the Efficiency of the Junior High School. At best, individual pupils similar in general mental capacity differ in their attainments from one phase of school work to another. Whether due to specialized capacities or to specialization in interests, it makes for heterogeneity in instructional groups. These differences are still further accentuated for junior high school students when there is any marked unevenness of emphasis upon the different phases of work from one elementary school to another. How important a factor this may be in interfering with group homogeneity in junior high school classes will be apparent from a few of the class record cards of two of the schools whose sixth-grade classes contributed to the junior high school class pictured on Chart 5. On contrasting Plates 48 and 49 it is evident that in the information phase of American history three out of every five sixth-grade pupils in school U are doing sixth-grade work or better, whereas only one pupil out of the entire sixth-grade class in school V is doing sixth-grade work. In fact, only one out of every six pupils is doing even as well as fourth-grade work. While a third of the pupils in school U are doing an average quality of work or better, more than two thirds of the pupils in school V are three years below the average quality of work for pupils of their mental age. The mid mental age of the sixth-grade pupils in school U is slightly higher than that of the sixth-grade pupils in school V, but the difference is only about two months. The difference in amount of emphasis placed upon the information phase of American history in the two schools creates for the teacher of history in the junior high school a problem of teaching in the same class two groups of pupils who differ in attainments by three school grades. Of course, it may be argued that the sixth-grade classes from the two schools might be kept as units in the junior high school. But in that case

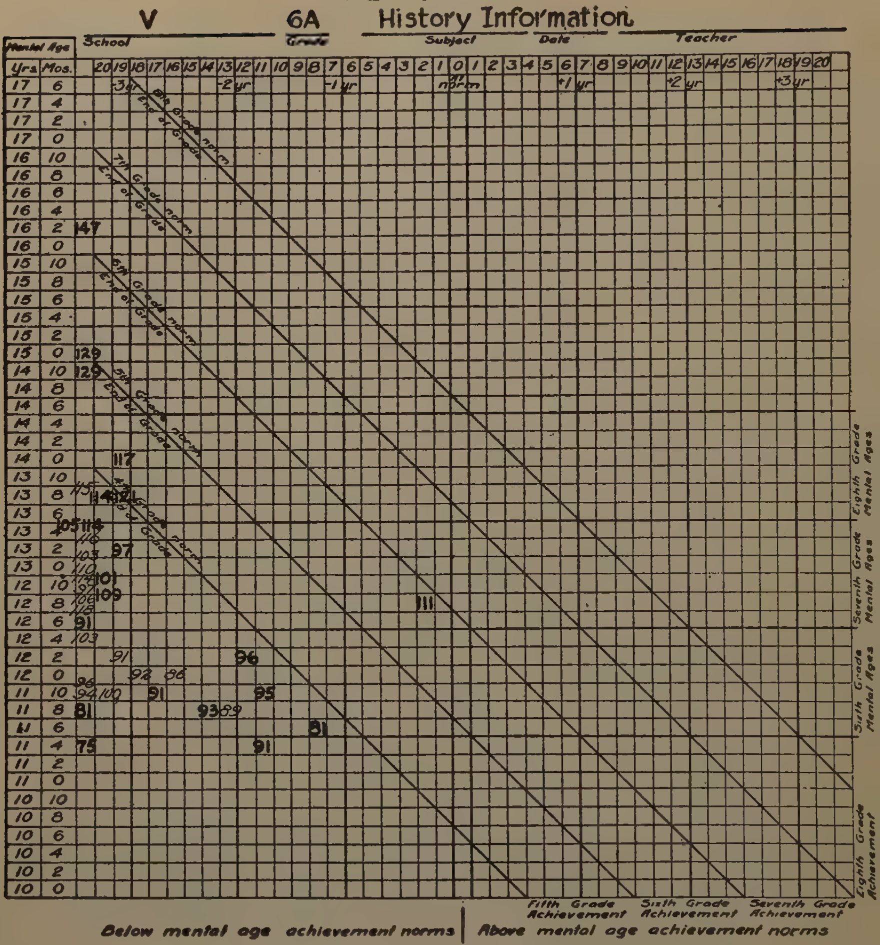
PLATE 48



CLASS RECORD CARD - B

the pupils might just about as well remain in the elementary schools until they complete the eighth grade, as the special advantages of the junior high school organization would be largely lost in the keeping of the elementary school classes intact. As the emphasis differs in the elementary schools from subject to subject it might seem advisable to organize the junior high school classes in such a way that the pupil could attend the class in

PLATE 49


School: V
Grade: 6A
Subject: History Information
Date:
Teacher:

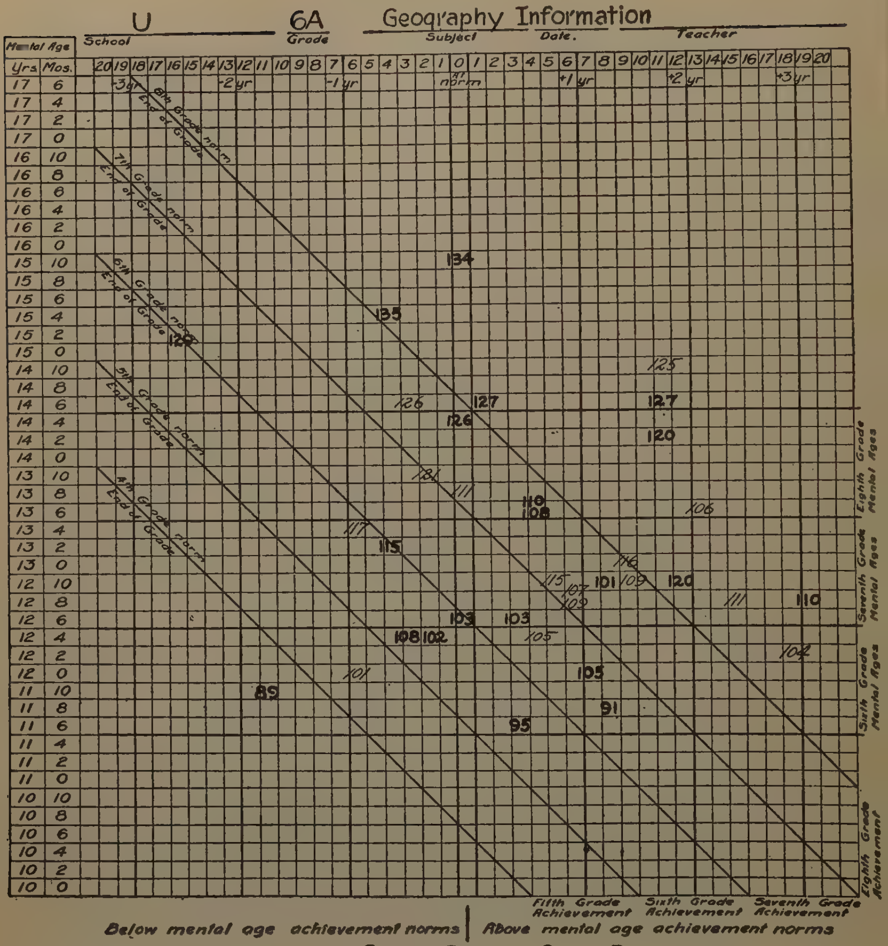
CLASS RECORD CARD - B

American history, for example, for which his previous preparation best fits him. Confusing as such an administrative organization might be, it could be adjusted, especially as the administrative machinery should exist for effective practice—a fact frequently overlooked. Some really serious problems arise in connection with such an arrangement, however. First of all, the brighter pupils of school V would have to be placed in a class with the duller pupils of school U in spite of the fact that they could make much more rapid progress in their work. In the second place, this plan would fail to bring the brighter pupils of school V up to a reasonable degree of attainment for their mental capacities as compared with pupils of like capacities from school U. Far more effective than any such remedial schemes would be a somewhat equal emphasis upon each phase of school work from school to school. That would very largely, if not entirely, eliminate the problem. The proper use of the results of mental tests and educational scales in the elementary schools would not only render such an equalization in emphasis feasible but would also be of distinct value to the teachers in adjusting the work of the schools to the capacities of the individual pupils.

That a false impression may not be given that variation in emphasis characterizes the information phase of American history alone, Plates 50 and 51 have been included to demonstrate the same tendency toward variation in emphasis in the range of information in geography. In the sixth grade of school U one out of each three pupils has a range of information as wide as the average eighth-grade pupil. Only one pupil in school V approximates this attainment. Although only one pupil out of five in school V is doing as well or better than should be expected of the average sixth-grade pupil, two out of each three in school U are up to the seventh-grade norm and five out of each six are at or above the sixth-grade achievement norm. In quality of work five out of each seven pupils in school U are doing work of an average quality or better, but in school V only one out of each six is maintaining an average quality or better. While a hasty glance at the two plates may give the impression that in range of information in geography the two classes are not so widely different, a closer examination indicates that the differences are nearly as great as in the case of American history. Consequently, whatever was said about the difficulties that arise in adjusting the pupils in these two schools in the classes in American history applies equally well in the case of the range of information in geography.

A considerably more even distribution of emphasis is found in the fundamental operations of arithmetic. Yet, while two out of each three pupils of school U are doing an average quality of

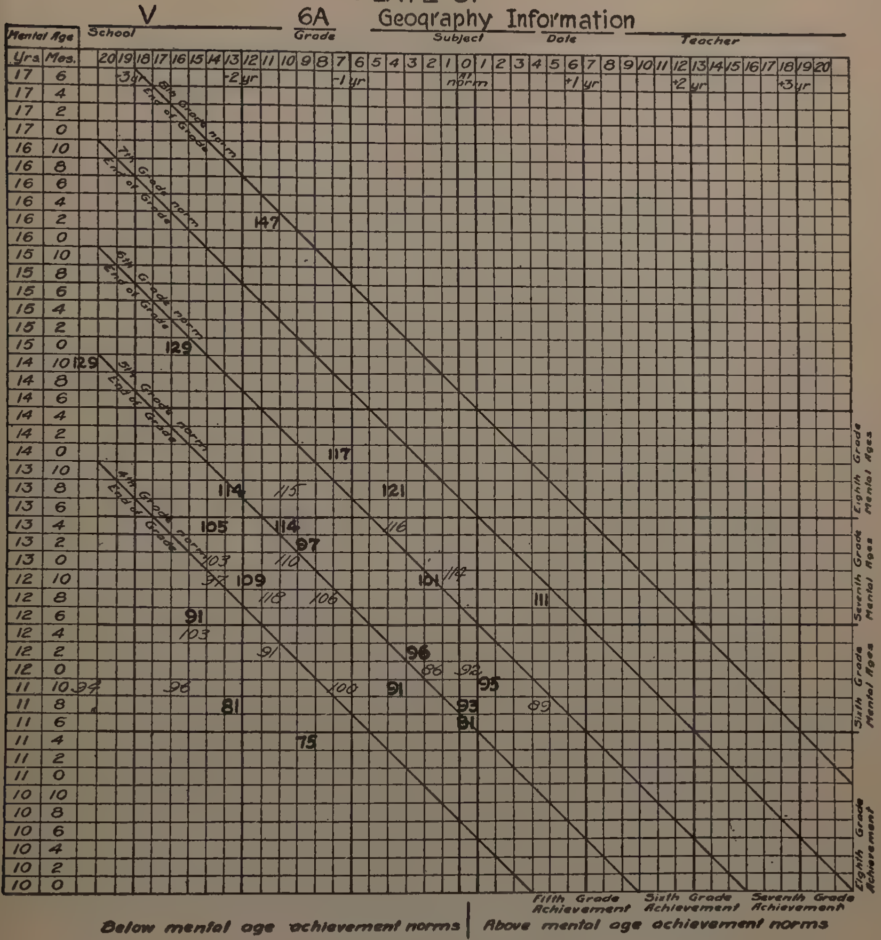
PLATE 50



CLASS RECORD CARD – B

work or better only five out of each nine are attaining the same standard of quality in school V. Although only one out of seven falls below the sixth-grade achievement norm line in school U, about three out of ten fall below it in school V. Different as the sixth-grade classes in these two schools are in the fundamental operations of arithmetic, there is only one phase of school work measured where they show even a slighter degree of difference.

PLATE 51



CLASS RECORD CARD - B

It is obvious not only that the wide differences in emphasis found in the case of the range of information in American history and geography play a significant part in adding to the problems of the junior high school teaching staff, but also that the difference in the average quality of work done in the two schools is a serious problem. It involves the more basic factors of habits of work, methods of study and attitudes toward achievement.

Inter-School Supervision Is Just as Important to the Elementary Schools as to the Junior High School. From the junior high school point of view the kind of supervision that will bring about a greater degree of evenness of emphasis from school to school in each phase of school work as well as a more uniform quality of work is almost imperative for a successful functioning of the junior high school. The elementary school principals themselves realize in many instances the lack of such uniformity and also feel relatively helpless to attain it. As a matter of fact, the survey whose results are embodied in this chapter and the previous one grew out of a desire on the part of the elementary school principals whose pupils went to the junior high school to find out just what differences in emphasis and attainment are characteristic of the work of their own schools, as well as to find out just what standards of attainment and quality of work should be accomplished before the pupils are promoted to the junior high school. The problems arising out of the survey are quite as much the problems of the elementary school principals and teachers as they are the problems of the junior high school teaching staff. Not only that, but the elementary school principals were the ones most desirous of attacking the problems from a measurement standpoint. The plates presented in this chapter are samples of complete sets worked out for these principals. The classification chart, Chart 5, was developed quite as much for the guidance of these principals in making their promotions as it was for the guidance of the junior high school principal in making the classification of pupils.

CHAPTER XIV

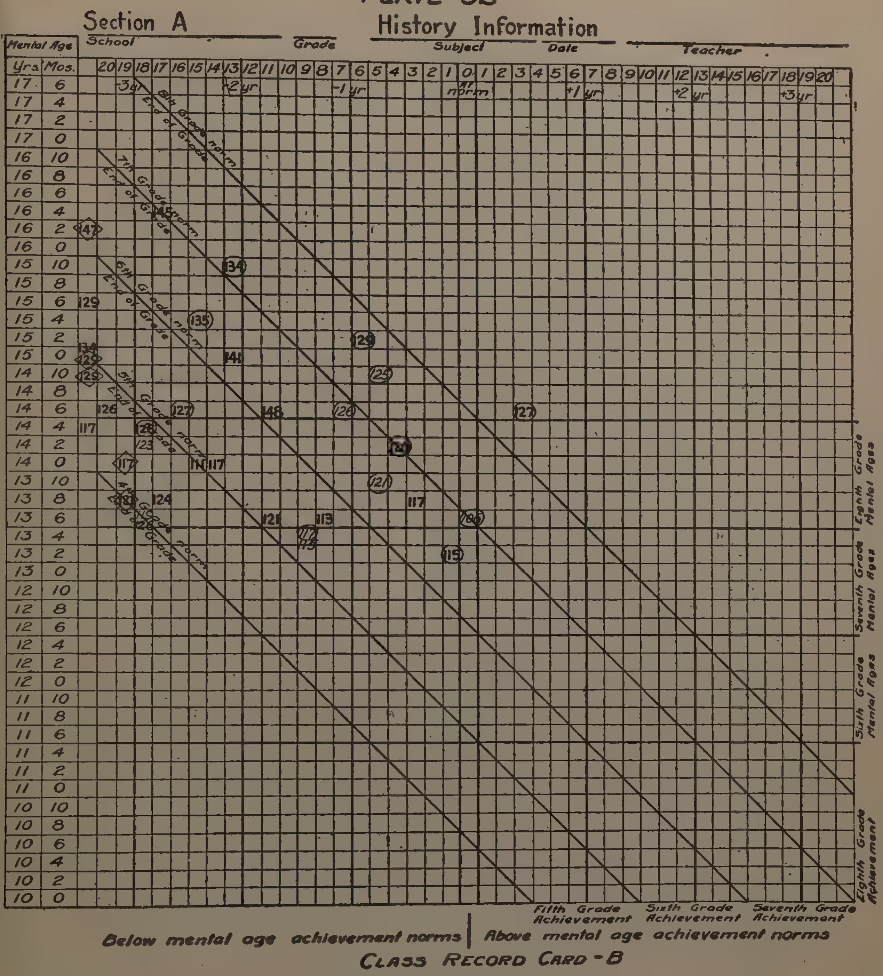
ACQUAINTING THE TEACHER WITH HER CLASS

Important as it may be to discover the actual instructional conditions in a classroom or in a school system or to classify the pupils into more homogeneous groups for instructional purposes, a still more important use to which educational tests may be put is that of acquainting the teacher with her class as a group and also with the individual children in it. For the teacher just beginning work with a new class it is even more important to know what phases of school work have been underemphasized than to know what phases she herself has had a tendency to underemphasize. It is quite as significant for her to realize that in certain phases of instruction the girls in her class have not been held up to the same quality of work as the boys as it is to discover that she herself has been in the habit of holding the boys to a better quality of work than the girls. That the superior pupils in her new class have received too little attention is just as significant to her as the fact that she herself has tended to favor the less gifted pupils in supervising their work.

Where Measurements Have Been Made as One of the Bases for Promotion and Classification the Tabulations May Be Profitably Discussed with Teachers of the New Classes. A table like that on Plate 48, page 183 will, if carefully explained to a teacher, give her a better acquaintance with her class than any amount of verbal description. Should she have the D section, for example, such a table would show her at once that she has a beginning sixth-grade class of pupils even though they bear a seventh-grade label. The discovery, shocking though it might be, that the pupils are even significantly below the fifth-grade achievement norms in all phases of school work except the thought phase of geography, would enable her to deal with the class more intelligently and would also give the supervisor a more sympathetic understanding of the teacher's problems. Nor would such a table be any less significant to the teacher of the A section. She would understand that the class, although labeled a beginning seventh-grade class, is in reality almost a beginning eighth-grade class in mental age, better than the average beginning eighth-grade class in reading, the fundamental operations of arithmetic and arithmetic problems, and at least equal to a class half way through the seventh grade in the thought phase of both American history and geography. She would realize that this class could not be taught the usual seventh-grade content; they already know a good part or else all of it in some phases of instruction. The supervisor would have a definite objective basis for ascertaining and explaining why the usual seventh-grade curriculum could not be followed with this group of pupils.

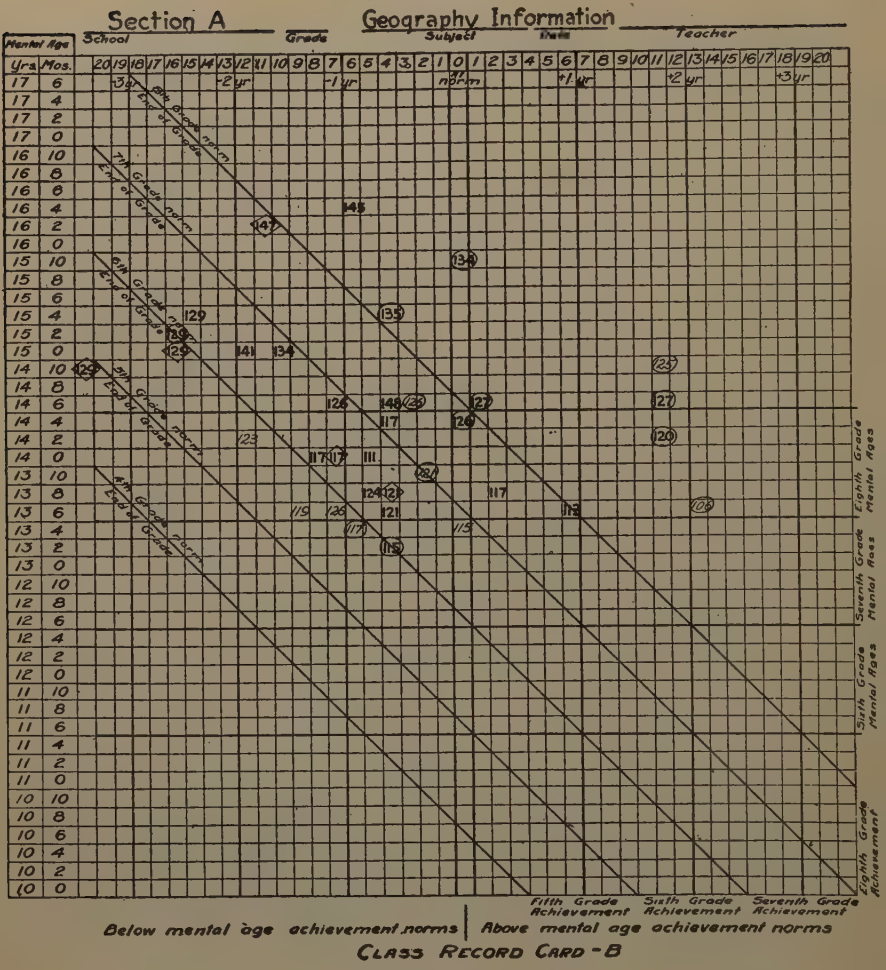
The Data on the Class Record Card Affords a Much More Detailed Analysis of a Teaching Situation. The data on Plate 52 shows the teacher at a glance that in the A section of the junior high school class discussed in chapter 12, this superior group of pupils has only a beginning seventh-grade range of information in American history. As many cases are above the oblique sixth-grade achievement norm line as below it. Although a group of pupils with mental ages resembling an eighth-grade class at graduation time, its sixth-grade label is actually indicative of its achievement attainment. In quality of work all but a very few are markedly below the average. Only one case is at the right of the "At norm" column and only one is in it. Yet with adequate attention to this phase of instruction much more than the usual seventh-grade content can be covered with these pupils whose rates of achievement range from 106 to 147, with a mid intelligence quotient of 125. Although the group is a fairly homogeneous one in mental age, in achievement the attainment ranges from that of an average fourth-grade pupil to that of an average eighth-grade pupil. The extremely poor quality of work of many of the superior pupils accounts in no small measure for this condition. One of the problems of the teacher of this class is to arouse in these superior pupils a desire to achieve a normal range of information in American history for pupils of their capacity. In order to assist the teacher of this class in locating the conditions responsible for some of the variations in quality of work a circle was drawn around the indices of the pupils com-

PLATE 52



ing from school U and a diamond shaped figure around those sent from school V. School U in chapter 12, it may be recalled, was nearly a year in advance of school V in most phases of instruction. In range of information in American history it was more than three grades in advance of school V. It is no surprise then that most of the indices with the circles around them are found near the "At norm" column and that all are

PLATE 53

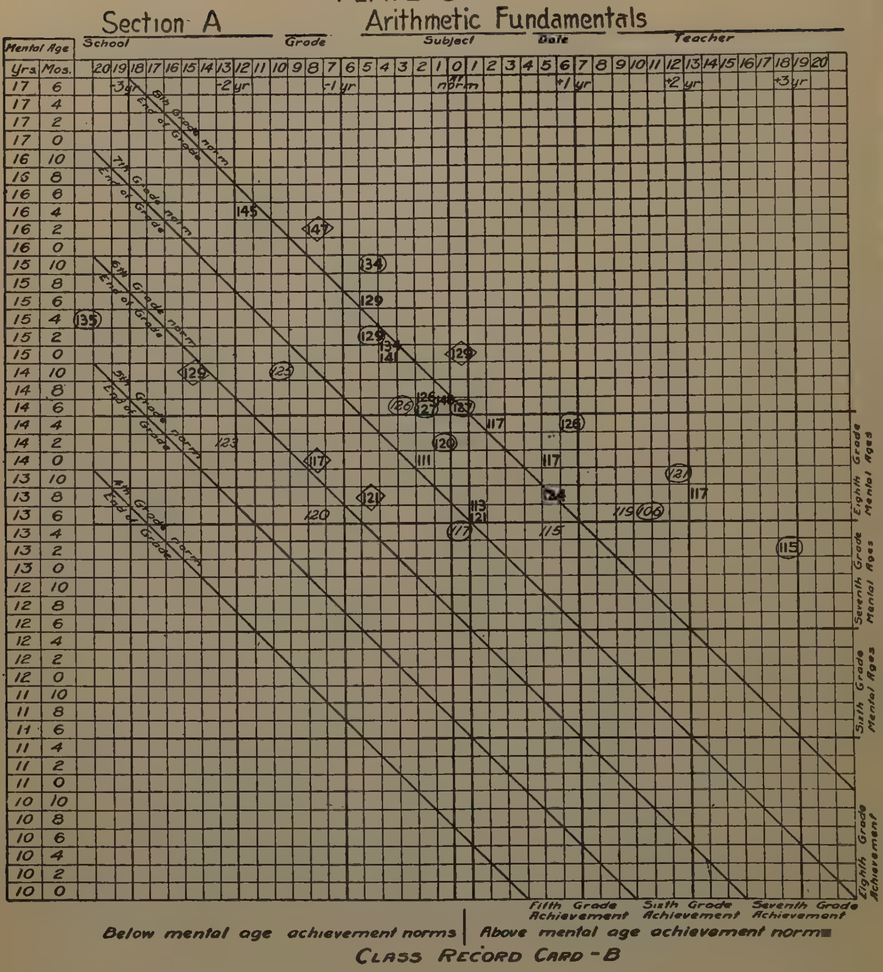


at the right of the "—3 yr." vertical line, while all the indices in the diamond shaped figures are at the left of it.

In geography (Plate 53) the class is already at the seventh-grade norm for the end of the grade. Half of the pupils have as wide a range of information as the average seventh-grade pupil at the completion of his work in geography. The pupils of this class are not average seventh-grade pupils. If the seventh grade standard is indicative of a sufficiently wide range of geographical information for all pupils, then the advisability of giving this class further instruction in geography may be questioned. But if attainment in any phase of school work should be proportional to the intelligence of the pupils, as many educators think, then this class will need to be given a content in geography considerably more difficult than that provided for the average beginning seventh-grade class. They should also be held for making greater gains in achievement than the usual class. Although they have accomplished much more in geography than in American history, their quality of work is still considerably below normal. Again, more than half of the pupils entering from school U—the placements with circles around them—are doing an average quality of work or better, while none coming from school V reach the "At norm" column and only one is even within a full year of it. In geography, too, the mentally more mature students have received too little attention. They need a content that will be a challenge to them to master. They also need assistance in discovering more efficient ways of mastering the more difficult content.

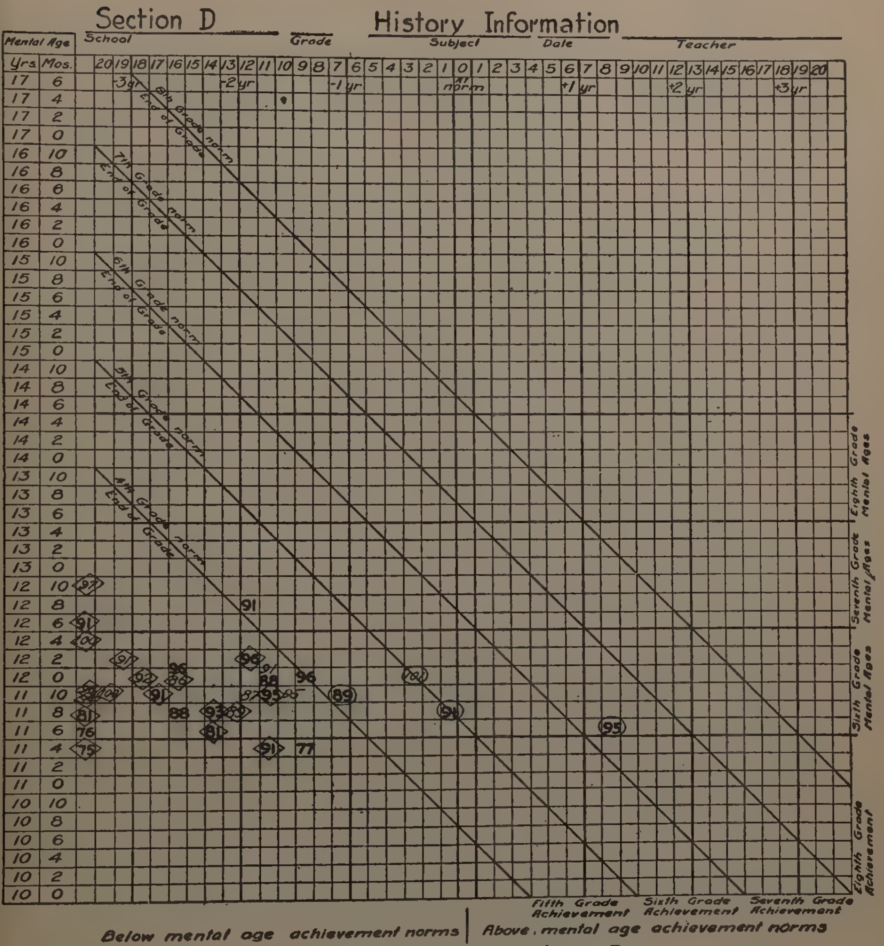
In the fundamental operations of arithmetic (Plate 54) the class stands nearly as high as the average eighth-grade class at the end of the grade. Although there is a wide variability in quality of work, the range of achievement in the fundamental operations is even narrower than in the information phase of geography. The most competent pupils do not markedly surpass the eighth-grade standard indicated by the upper oblique eighth-grade achievement norm line. Very few of the class make an achievement record as low as or lower than the seventh-grade norm for the end of the year. This narrow range in achievement has been secured in the elementary schools, however, at the expense of the superior pupils. The pupils who are farthest above the eighth-grade achievement norm line are among the mentally youngest pupils in the class and most of them are from school U. The mentally older pupils cluster around this norm line or else fall far below it. That the gifted pupils need less ability in arithmetic than the others is highly improbable. And it is likewise unlikely that the mentally younger pupils are in need of so much greater ability in the fundamental operations of arithmetic than in either American history or geography.

PLATE 54



Similar records are also quite as valuable to the teachers of the less gifted section in this same junior high school. Plate 55 shows that the D section is a very homogeneous class in mental age. But it is a class about half way through the sixth grade in mental age instead of a beginning seventh-grade class. In rate of achievement only three pupils are up to the average. More than a third have intelligence quotients below 90. For the gifted

PLATE 55



CLASS RECORD CARD – B

teacher this section will not be an inspiring class to teach. Their achievement in the information phase of American history indicates an even poorer quality of work than characterized the A section. The few pupils who are within a year of an average quality of work and who are surpassing the fourth-grade achievement norms all came from school U. Most of the others came from school V and of those who did, not one has reached the fourth-grade norm in achievement. With their low achievement quotients and their comparative innocence of historical information the teacher must be content with trying to teach them fifth-grade American history. Furthermore, neither the supervisor nor the teacher of history should expect better than a fifth-grade achievement of this class in the information phase of American history at the end of the year even though more than the usual amount of emphasis is given to it.

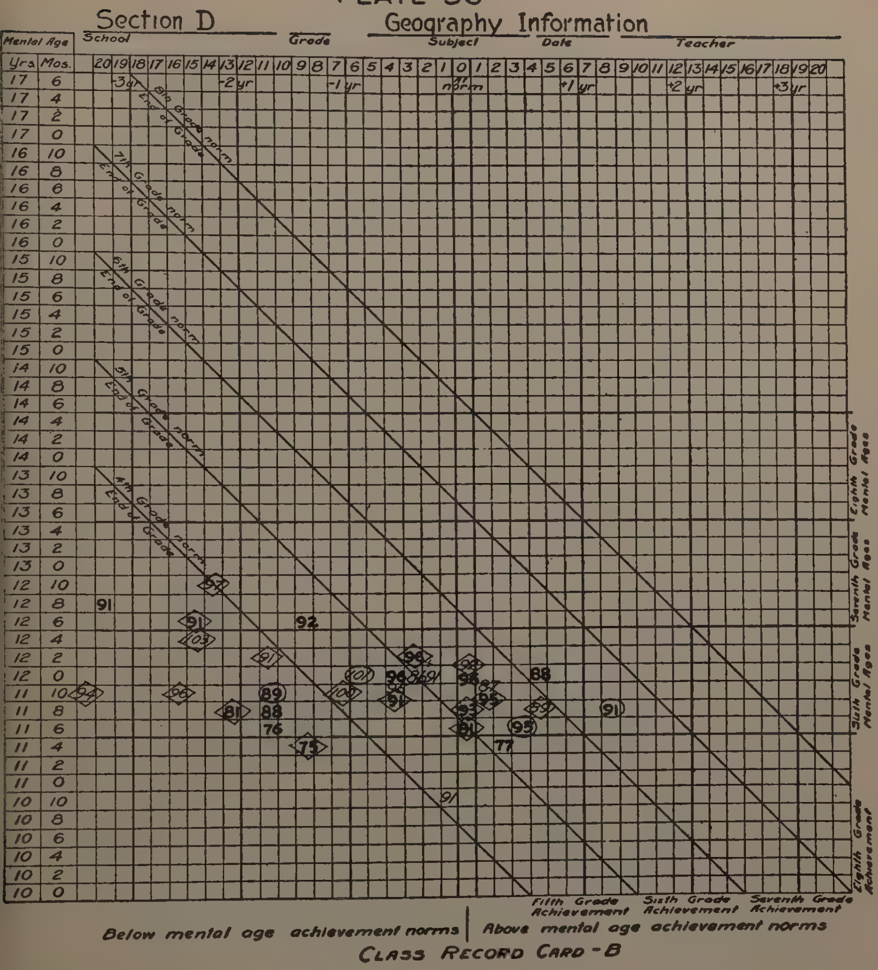
In the information phase of geography (Plate 56) only two of the pupils surpass the sixth-grade achievement norm. Nearly half of the class cluster around the fifth-grade norm and most of the rest around the fourth-grade norm. The content in geography as well as in American history must be even simpler than that of an average sixth-grade class even though the D section is labeled a seventh-grade class.

The pupils of the D section, like those of the A section, are doing a better quality of work in the fundamental operations of arithmetic (Plate 57) than in the information phase of either American history or geography. One half of the class are even doing a superior quality of work and surpass the sixth-grade achievement norm. Owing to the wide variation in the quality of work, the range of achievement is also fairly wide in the fundamental operations of arithmetic as well as in history and geography. For the less gifted as well as for the superior pupils arithmetic has evidently been overemphasized in the elementary school and at the expense of ranges of information in American history and geography. In the junior high school classes the emphasis needs to be shifted to these content subjects.

Such records of the capacity, attainment and quality of work of a class enable the supervisor and the teachers to select the content for the class more wisely, to distribute the emphasis more evenly from subject to subject and to realize the necessity of giving as much attention to the methods of study and habits of work of the gifted pupils as to the achievement of the less gifted pupils in the same class.

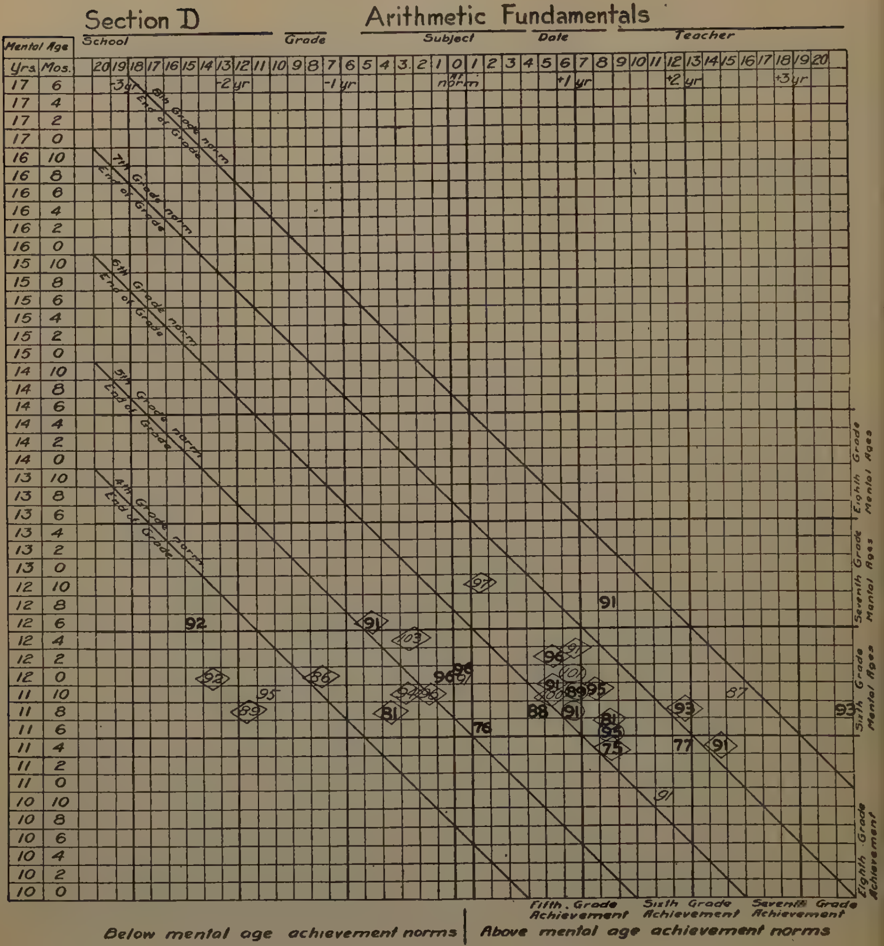
The Data for the Individual Pupils Are Just as Significant to the Teacher as the Data for the Class. The same data when combined on an individual record card may be used to show graphically for each pupil the relations among his mental and

PLATE 56



chronological ages, his grade location and his achievement in the various phases of school work. Near the top of the class record cards on Plates 52, 53 and 54, there is the identification number of a boy whose intelligence quotient is 145. His mental age is between 16 years 4 months and 16 years 6 months. On Plate 58 the points at which the oblique lines join the three vertical lines at the left side of the card indicate to the teacher that Samuel R.

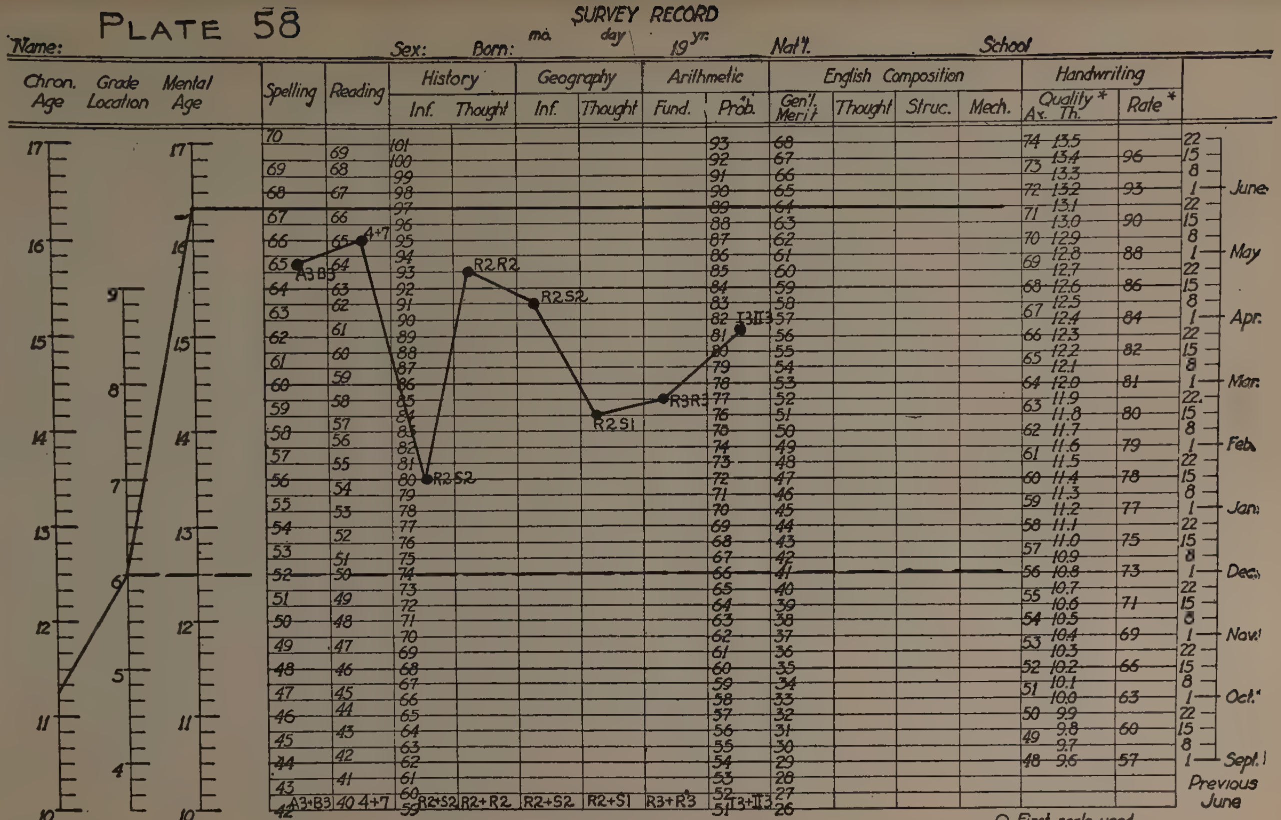
PLATE 57



CLASS RECORD CARD – B

was 11 years 3 months old at the time the tests were given, that he was just completing the sixth grade and that the average of his mental ages on two group intelligence tests was 16 years 4 months. The little circles in the body of the card just after 65 under spelling, 65½ under reading, 80 under history information, 93 under history thought, 91 under geography information, 84 under geography thought, 85 under arithmetic fundamentals, and 81½

PLATE 58



M.Q. 144

*Approximate Norms

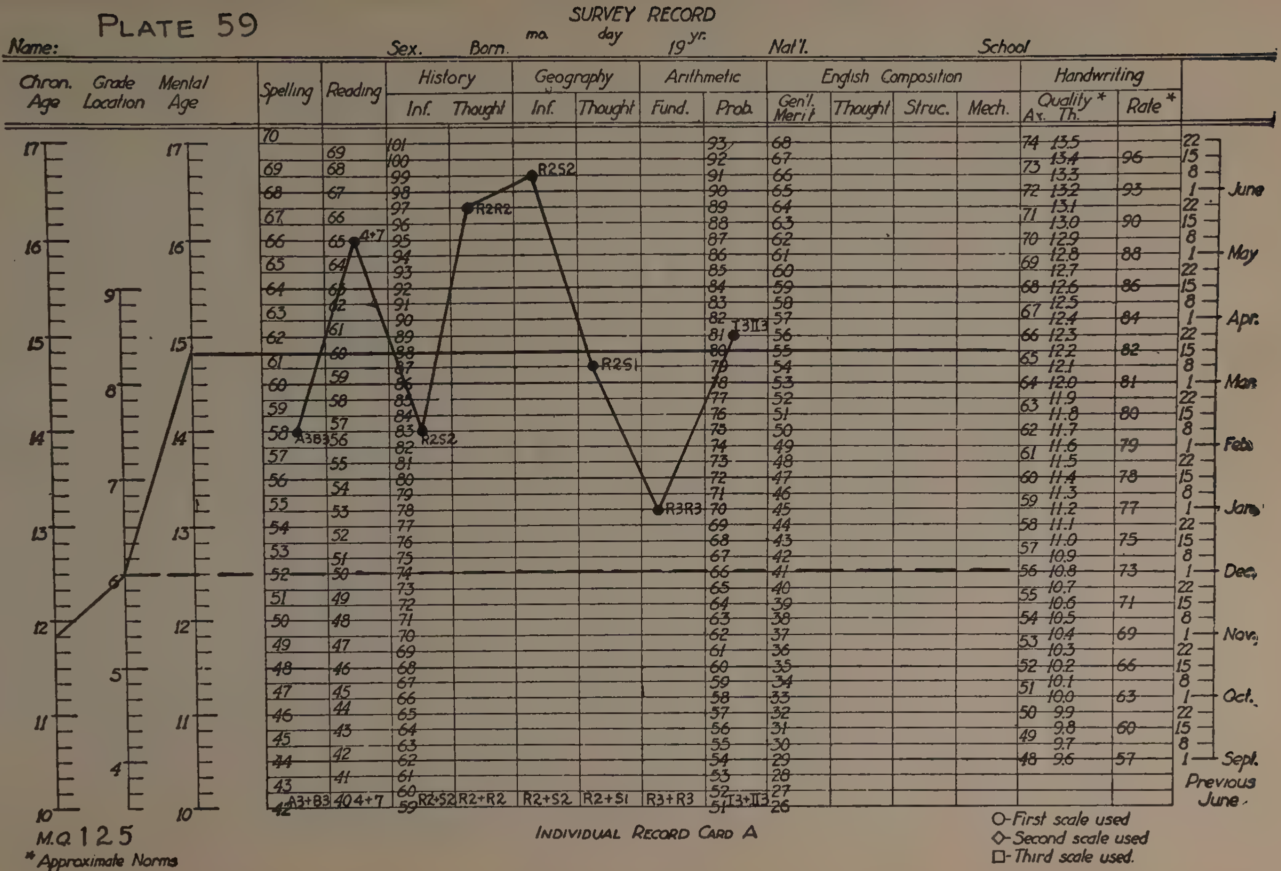
Individual Record Card A

○-First scale used
◇-Second scale used
□-Third scale used

under arithmetic problems, show the pupil's average scores in two educational scales in each of these phases of school work. The notations at the bottom of the card indicate the names of the scales used and also that the tests were given in June, just as the school was about to close. It will be noticed that all the little circles fall somewhat below the continuous line extending straight across the card from the pupil's mental age at the left. This indicates that in no phase of school work was the boy doing quite an average quality of work for a pupil of his mental age. At the same time these circles are all at least six spaces above the broken line extending straight across from the 6 on the middle vertical line. This means that the boy was also at least a year in advance of the sixth-grade achievement norms for the end of the sixth grade in every phase of school work measured. In some phases he is more than three years in advance of the sixth-grade norm. It is apparent on the card that on the average he is over two and a half years in advance of his grade norms. By following the line on which any achievement score circle falls until the left end is reached, the pupil's educational age in that subject can be read off from the nearest vertical line—the one with "Mental Age" at the top. For example, the 65 in spelling is opposite the second space below the 16, hence since each space is equivalent to two months, the pupil has an educational age of 15 years 9 months in spelling. In the same way it can be seen very readily that he has an educational age of 16 years 1 month in reading, 13 years 6 months in the information phase of American history, 15 years 8 months in the thought phase, 15 years 4 months in the information phase of geography, 14 years 2 months in the thought phase, 14 years 4 months in the fundamental operations of arithmetic, and 15 years 1 month in arithmetic problems.

On the same class record cards—Plates 52, 53 and 54—is the identification number of a girl with an intelligence quotient of 125. It is in the row with 14-10 at the left, indicating her mental age as at least 14 years 10 months. These facts about Alice T, as well as her achievement record, are indicated on Plate 59. Except in spelling and the fundamental operations of arithmetic she has quite as high an achievement record as Samuel R on Plate 58. She, too, is not only above the sixth-grade norms for the end of the year but she is also above the seventh-

PLATE 59



INDIVIDUAL RECORD CARD A

grade norms in all phases of instruction except the fundamental operations of arithmetic, as is indicated by all but one of the little circles being more than six spaces above the broken line extending straight across the card from the 6 on the middle vertical line. In four or half of the phases of work measured the little circles are also above the continuous line running straight across the card from the point indicating her mental age of 14 years 10 months on the third vertical line. This girl has done a superior quality of work for pupils of her mental age in half of the things she has attempted to master in school—in reading, in the thought phase of history, in the information phase of geography, and in arithmetic problems. She, too, is more than two and a half grades in advance of the sixth-grade norms.

As the teacher glances through such individual record cards at the beginning of the new term she will notice at once that Alice needs to give somewhat more attention to spelling and the fundamental operations of arithmetic than does Samuel. In fact, the location of her identification number on Plate 54 indicates that she has been doing a poorer quality of work in this subject than all but four in the class. In the information phase of American history also she needs to do better work, just as does Samuel, even though few in the class surpass her in either quality of work or achievement. In nearly all phases of instruction Samuel is falling decidedly below his mental-age norms. His methods of study and habits of work are quite as much in need of investigation by the teachers as the conditions to which Alice T's deficiency in the fundamental operations of arithmetic are due are in need of discovery through diagnostic testing. Far more marked differences than are found on these two record cards will be discovered in every elementary or junior high school class.

Where mental tests and achievement scales have been used for discovering the instruction conditions in a school, for deciding upon promotions or for classification purposes, and the results have been recorded on the permanent record cards, both the class cards and the individual record cards can be very easily and quickly made out by competent clerical assistance.

CHAPTER XV

SIGNIFICANCE OF EDUCATIONAL MEASUREMENTS FOR THE HIGH SCHOOL

So far the use of tests in the high school has been largely confined to two functions: classification on the basis of mental test scores and intercomparisons on the basis of achievement test scores. The contribution made to secondary education by the mental tests has been of great value for the grouping of students into more homogeneous classes, for comparing the capacities of high school students from one community to another, in indicating the wide range of capacities among high school students and in suggesting why certain students tend to drop out early and others remain to complete their high school course of study. With the achievement tests and scales it has been possible to discover such facts as the wide ranges of ability in nearly every class, the differences in achievement from one school to another in the same subject, the effectiveness of certain conditions of instruction, the normal amount of gain to be expected as a result of a year's course in a measurable subject and the relations between school marks and achievement on the tests. During the last few years mental tests for measuring capacities to succeed in high school and educational scales for measuring abilities in English composition, language and reading, and ranges of information in American history, general science and physics have appeared in rapid succession. In time educational scales, with mental-test norms similar to those in practically all the elementary school subjects, will undoubtedly be available for measuring nearly every phase of high school instruction.

High School Freshmen Differ Widely in Mental Maturity. That high school freshmen differ in capacity is no new discovery. Yet as long as secondary school education was largely confined to the small proportion of the population who could afford it the differences in capacity were undoubtedly far smaller than they are at present. As a very large proportion of the eighth-grade pupils now enter high school in many communities, the variability of the freshman class in capacity is nearly as great as that of any one of the grades in the elementary school. In the fifth frequency column in Table 18—the one headed "A-D" classes—the students entering high school A vary in mental age from less than 12 years to more than 17 years.

When the 105 freshman students of this high school were classified into four groups on the basis of their mental ages, intelligence quotients, achievement and quality of work, the A and D sections are seen to differ in mental age by nearly three and a half years. Although this grouping was based upon achievement and quality of work as well as capacity, it is clear that there is no overlapping in mental age either between the two extreme groups or even in case of every second group, and very little among the consecutive groups. The fact that a very small proportion of students with intelligence quotients as low as those possessed by the students in the C and D sections complete even the first year of high school successfully and also that a very small proportion with intelligence quotients as low as those possessed by the students in the B section are graduated from the high school suggests a critical problem for the high school. Along with the increasing enrollment there is a steadily mounting elimination. Nor could any other condition reasonably be expected unless the standards of achievement in high school are lowered, the standards of high school entrance raised, or the work of the high school adjusted to fit the capacities of the students.

Lowering standards to meet the capacities of the average students can only mean the passing of the gifted students along to the colleges and professional schools with a less adequate education and either at an earlier age or else with a poorer quality of work than in the past. This method of meeting the problem utterly fails to offer a reasonable solution.

Nor would the second method—that of raising the entrance requirements—be likely to offer a more rational solution of the problem even if it could be carried out. Merely retaining the less gifted pupils longer in the elementary school will not increase their intelligence or rate of gain in mental age. It may even be questioned that these pupils need as wide ranges of information or as complex abilities in the elementary school subjects as the superior and gifted pupils. Their further retention in the elementary school would probably result in their not entering high school at all. This would save the high school some embarrassment but these children who are most in need of some vocational training would be the one group without it. Adjustment of the work in the high school to fit the capacities and needs of the students is by far the most reasonable method of meeting the problem of changing conditions of high school entrance.

Both Classification of the Students and Adjustment of the Work to Their Capacities Are Essential for Successful Work in the High School. A glance through the first four frequency columns in Tables 19 through 26 shows but a slight amount of overlapping of the A and D sections in spelling, ranges of information in American history and geography, and the fundamental operations of arithmetic, and still less in reading and the thought phases of elementary school instruction. Surely no high school teacher of English could hope to teach in the same class students who differ as widely as even the mid students of the A and D sections differ in their mental ages and in their abilities in spelling and reading for comprehension. Nor could the teacher of algebra or general mathematics hope to instruct successfully in the same class students who differ as widely in arithmetical abilities as well as in mental age as the mid students of the A and D sections differ in these traits. Even when all four factors were taken into consideration in the classification of these students the mentally youngest pupil in the A section is a year and a half older mentally than the mentally oldest pupil in the D section. While the mid mental age of the A section is 16 years 3 months that of the D section is 12 years 10 months—a difference of nearly three and a half years. In spelling the mid scores of the A and D sections differ by more than two and a half years, in reading by three and a half years, in the fundamental operations of arithmetic by over two years and in arithmetic problems by three and a half years. Nor are these sections much more alike in the content subjects of American history and geography. In these the differences in the mid scores range from a year and a half in the information phase of geography to three years in the thought

TABLE 18

Distributions of Mental Ages

Mental Ages Yr-Mo	High School A					High School B			High School C		
	A Class	B Class	C Class	D Class	A-D Classes	A Class	B Class	A-B Classes	A Class	B Class	A-B Classes
11-8				1	1						
11-10				1	1						
12-0				1	1						
12-2											
12-4				2	2						
12-6				2	2						
12-8				4	4						
12-10				-2-	2		1	1			
13-0				4	4						
13-2			1	4	5		1	1			
13-4			2	2	4						
13-6			5	1	6		1	1		1	1
13-8			1		1		1	1		1	1
13-10			3		3	1*	1	2		1	1
14-0		3	-6-		9		1	1		1	1
14-2			7		7	1*		1		2	2
14-4		3	2		-5-	2**	1	3		2	2
14-6		7	1		8		5	5		1	1
14-8		-4-			4		-4-	4		2	2
14-10		3			3		4	4		-2-	2
15-0	1	4	1		6		2	2		4	4
15-2	1				1		2	2		1	1
15-4	1	2			3		2	2		3	3
15-6	3	1			4	2*		2		3	3
15-8	1				1		4	4	1	1	2
15-10	1				1	2		2	2		2
16-0	2				2	1		1	5		5
16-2	1				1	3	1	4	2		2
16-4	-5-				5	2		2	1		1
16-6	1				1	-3-		3	2		2
16-8	1				1	2*		2	1		1
16-10						2*		2	5		5
17-0	4				4				2		2
17-2	1				1	3		3			
17-4						1		1			
17-6	2				2	1		1	1		1
17-8						2		2	2		2
17-10						1		1	2		2
18-0											
18-2											
18-4									2		2

TABLE 19

Distributions of Spelling Score

Scale Score	High School A					High School B			High School C		
	A Class	B Class	C Class	D Class	A-D Classes	A Class	B Class	A-B Classes	A Class	B Class	A-B Classes
43											
44											
45				2	3						
46				1	1						
47											
48				1	1						
49			1		1						
50		1	1	4	6						
51		1	2		3						
52		1	2	-3-	6					1	1
53		1	3	2	6				1	1	2
54			3	2	5						
55		1		1	2						
56	2	2	1		5		1	1		4	4
57	2	2	1	2	7		3	3		3	3
58	1	4	4	2	-11-						
59		-4-	5	1	10				3	-4-	7
60	1	1	1	1	4	2**		2	4	1	5
61	2	2			4	1*		1	3	1	4
62	3	2	1		6		1	1	1	2	3
63	-4-	2			6	3*	2	5	-3-	2	5
64	2	2	1		5	4*	2	6	2	3	5
65							6	6		2	2
66	2		1		3	3*	-4-	-7-	4		4
67	1				1	-2*-	1	3	3	1	4
68	1				1	5	2	7			
69	1				1		2	2			
70	2				2	4*		4	2		2
71	1				1		1	1	1		1
72						1		1			
73							5	5			
74								1			
75											
76						1		1			
77						1		1			
78						1	1	2			

* Each asterisk indicates the score of the eight pupils promoted directly from the seventh grade to the high school in High School B.

TABLE 20

Distributions of Reading Scores

Scale Score	High School A					High School B			High School C		
	A Class	B Class	C Class	D Class	A-D Classes	A Class	B Class	A-B Classes	A Class	B Class	A-B Classes
40				2	2						
41				3	3						
42				1	1						
43											
44				2	2						
45											
46				3	3						
47										1	1
48		1	3	1	5						
49				—							
50			3	2	5						
51									1	1	2
52	1	4	2		7					1	1
53										1	1
54		3	5	5	13						
55		1	-7-	4	-12-					5	5
56									1	2	3
57	1	4	3		8				1	1	2
58										-2-	2
59	6	-5-	3		14		3	3		2	2
60											
61	1	2	2		5		1	1	2	1	3
62						1	2	3			
63	5-	4		1	10	2*	3	5	1	3	4
64							4	4	2	2	-4-
65			1		1	1*	-7-	8	5	1	6
66	4	1			5	8	2	-10-	-3-		3
67						-6‡-	4	10	2		2
68	3	1			4	2		2	2	1	3
69							3	3	2		2
70						4	1	5	1		1
71	1	1			2	3		3			
72						2	1	3	1	2	3
73	1				1				1		1
74									2		2
75											
76	2				2						
77									1		1
78											

TABLE 21

Distributions of Information Scores in Amer. History

Scale Score	High School A					High School B			High School C		
	A Class	B Class	C Class	D Class	A-D Classes	A Class	B Class	A-B Classes	A Class	B Class	A-B Classes
59		1	2	6	9					1	1
60		1		3	4						
61			1		1						
62			2	1	3						
63			1	-2-	3						
64			2	1	3						
65		1	1		2				1		1
66		2	3		5				1		1
67	1		1		2					1	1
68	2	4		2	8				1	1	2
69		2	-6-	1	9		3	3	1	1	2
70		-3-	2	2	-7-					3	3
71	1			2	3					3	3
72	3	2	1		6				1	1	2
73		1	3		4		1	1	1	1	2
74	2				2		2	2	2		2
75	-5-	1			6	1		1	2	1	3
76		2	2		4	2*	1	3	1	—	1
77	4		1		5		2	2		4	-4-
78	1	1		1	3		1	1	2	3	5
79	2	1	1		4		3	3	-2-	1	3
80	1	2			3		-3-	3	3		3
81						1*	4	5	1	1	2
82						2*		2	2	1	3
83						6‡	2	-8-	1	1	2
84	1				1	-3‡-	2	5	1		1
85		1			1	3*	2	5	1		1
86						1		1			
87						1		1	2		2
88							2	2		1	1
89							1	1			
90						1		1			
91	1				1	3	1	4	2	1	3
92											
93						3		3			
94											
95						2	1	3			
96											
97											
98											
99											
100											
101											
102											
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phase of American history. In the face of such differences the absolute necessity of grouping high school freshmen on the basis of their capacity and their achievement and quality of work in the elementary school would seem unquestionable.

But classification alone is not enough in the high school any

TABLE 22

Distributions of Thought Scores in American History

Scale Score	High School A					High School B			High School C		
	A Class	B Class	C Class	D Class	A-D Classes	A Class	B Class	A-B Classes	A Class	B Class	A-B Classes
59 or less										1	1
60				1	1						
61											
62											
63				1	1						
64			1	2	3						
65											
66				3	3						
67											
68				1	1						
69			5	2	7						
70			1	2	3						
71											
72		1	2	—	3						
73		1			1						
74		1	1	2	4				1		1
75				3	3				1		1
76			1	2	3						
77		1	3	2	6		1	1			
78			1		1					2	2
79	1	1			2						
80		1	1	1	3				1	1	2
81		2	2	1	-5-				1	2	3
82		3			3				1	7	8
83		-2-	1		3	1	1	2	2		2
84	3		4		7		1	1		-2-	2
85	1	1	2		4	1*	1	2		2	2
86	1	3			4		1	1	1		1
87						1*	3	4	1		1
88	2		1		3		1	1	2		-2-
89	2	1	2		5		1	1	2	1	3
90	2				2		2	2	-2-	3	5
91	3	1			4	2*	-4-	6	2	1	3
92					1		3	3			
93	1	2			3	3		3			
94						2	2	-4-	2		2
95	4	1			5	3	1	4	1	1	2
96		1			1	-2*-	4	6	2	1	3
97						2*	1	3	3		3
98											
99									1		1
100						3		3	1		1
101	2				2	2*	3	5			
102						2		2			
103									1	1	2
104							1	1			
105						1		1			
106	1				1						
107						1		1			
108						1		1			
109						2		2			
110											
111											
112											
113	1				1						

TABLE 23

Distributions of Information Scores in Geography

Scale Score	High School A					High School B			High School C		
	A Class	B Class	C Class	D Class	A-D Classes	A Class	B Class	A-B Classes	A Class	B Class	A-B Classes
59 or less			1	1	2						
60											
61				1	1						
62			2		2					1	1
63			2		2				1	1	2
64		1		3	4				1	1	2
65				1	1						
66		1	1	3	5		1	1		1	1
67		1	3	2	6						
68			3	2	5					1	1
69	2	2	-3-	3	10					4	4
70		3			3		1	1		1	1
71		2	5	1	8		1	1	2	-4-	6
72	2	-4-		3	-9-		1	1	2	1	3
73	1	2	2		5				1		1
74		3	1		4		1	1	1	1	2
75	1	1	3	2	7		1	1	1	1	2
76	2	1	2		5	1	4	5	1	3	-4-
77	-7-	1			8	1	2	3	3	2	5
78	2	1		1	4	1	2	3	-2-		2
79	1	1			2		-3-	3	3	1	4
80	3				3	1	2	3	3		3
81	1				1		3	3	2	1	3
82						2	2	4			
83						2	1	3	2		2
84	2				2		1	1	2		2
85						3	1	4			
86						1	1	2	1		1
87						1		1			
88						1	1	2			
89						-3-	1	4		1	1
90						1		1		1	1
91											
92							1	1			
93						1*		1			
94						2*		2			
95						3*		3			
96						1*		1			
97											
98											
99						2*		2			
100						1*		1			
101											
102											
103											
104						1*		1			
105											
106											
107											
108											
109											
110											
111											
112											
113											

more than it is in the elementary school. The content needs to be selected with reference to the capacity of the students and to the value it will be to them. It is not enough to have even a broad system of elective courses. It is equally essential that the students be guided in selecting the courses that will be of value

TABLE 24

Distributions of Thought Scores in Geography

Scale Score	High School A					High School B			High School C		
	A Class	B Class	C Class	D Class	A-D Classes	A Class	B Class	A-B Classes	A Class	B Class	A-B Classes
59 or less				3	3						
60				1	1					1	1
61											
62											
63				2	2						
64		1	1	1	3						
65			1		1						
66			2	2	4						
67				1	1					1	1
68		2	1	2	5						
69				1	1						
70		1	2	1	4		1	1		4	4
71		1	4	1	6					3	3
72	2	2	-4-	2	10		2	2	2	3	5
73	1	1	1	2	5		2	2	1	-2-	3
74		1	1	1	3		2	2	1	2	3
75	2		4	2	-8-		2	2	2	4	6
76	1	3	2		6		1	1			
77	4	-2-	1	1	8		2	2	3	3	-6-
78	2	4	2		8	1	3	4	2	2	4
79		1	2	1	4	1	-5-	6	2		2
80	-6-	3			9	2	2	4	-3-		3
81	1	2			3	1	2	3	2		2
82	2				2	1	3	-4-	1		1
83	1	2			3	2	2	4			
84	1				1	4		4			
85	1				1	1	1	2	5		5
86						-4-		4			
87	1				1	3	1	4			
88						1*		1			
89											
90						1		1	2	1	2
91					1	1*		1		1	1
92									1		1
93									1		1
94											
95						1*		1			
96											
97						1*		1			
98											
99						1*		1			
100											
101						2*		2			
102											
103						1*		1			
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											

TABLE 25

Distributions of Scores in Fundamental Operations of Arith.

Scale Score	High School A					High School B			High School C		
	A Class	B Class	C Class	D Class	A-D Class	A Class	B Class	A-B Classes	A Class	B Class	A-B Classes
59 or less				4	4						
60											
61			1		1						
62				1	1						
63											
64		1			1						
65											
66				1	1					1	1
67											
68			1		1					1	1
69											
70			1		1					1	1
71			1		1				1	1	2
72				1	1					1	1
73				1	1					2	2
74				1	1					1	1
75	1	1	1	3	6				2		2
76		1	1	1	3				1	1	2
77	2	2	1	2	7		1	1		1	1
78				1	1				1	2	3
79	1	1	3	1	6		1	1	1	1	2
80	1			1	2				2	2	4
81	1	1	2	1	5		1	1	2		2
82	1	1	2	2	6		1	1		3	-3-
83	1	2	-2-		-5-		4	4	3	1	4
84	2		2	2	6	1	4	5	-4-	2	6
85		3			3	3*	3	6			
86	1	-3-	3		7	1*	-1-	2			
87	1	3	2		6	2*	1	3	3	3	6
88	-2-		1		3	1	4	5	2	1	3
89	3	1	1		5	2	4	-6-			
90									2		2
91		1			1				3		3
92											
93	1	1	1		3	3*		3		1	1
94		2		1	3						
95	4				4	-2-		2	1		1
96						14*	6	20			
97											
98											
99											
100											
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											

to them and that are adjusted in difficulty of comprehension to their capacities to achieve. It may also be as detrimental for a gifted student to elect a simple vocational course intended for the less gifted student as it would be for the latter to elect a course in advanced English composition or solid geometry. That the mental and educational measurements made in the elementary school may furnish a basis for guidance in the high school will be evident from a more careful study of Tables 18 through 26.

Whereas formerly probably only the pupils of the A section and those in the upper half of the B section in high school A would have attended high school, these now constitute only about three eighths of the freshmen class. Surely very few of the remaining five eighths can be expected to attain the standards of achievement of the A section except through a very unusual quality of work. Certainly in the D section, with a mid mental age only four months above that of the average sixth grade at the end of the year and with not a single pupil having a mental age above the seventh-grade norm at the end of the year, one would not expect to find any pupils with even an average eighth-grade achievement record. A glance through the fourth frequency column in Tables 18 to 26—the ones with D at the top—shows that in spelling, the information phase of American history and geography and the thought phase of geography and arithmetic not a single pupil in the D section stands above the eighth-grade norms, which are indicated by the heavy horizontal line, while in reading, the thought phase of American history and the fundamental operations of arithmetic only a single pupil surpasses the eighth-grade norms. The

TABLE 26

Distributions of Scores in Arithmetic Problems

	High School A					High School B			High School C		
Scale Score	A Class	B Class	C Class	D Class	A-D Classes	A Class	B Class	A-B Classes	A Class	B Class	A-B Classes
51 or less				7	7				1	2	3
52			1		1						
53										1	1
54										1	1
55			2	1	3					2	2
56											
57			1	2	3					1	1
58		1			1						
59		1	2		3		1	1		1	1
60							1	1		1	1
61			2	-3-	5						
62			1	1	2						
63			1		1		1	1		1	1
64									1	2	3
65		2	1	1	4				1	-3-	4
66				1	1				2	1	3
67			3	1	4				2	3	5
68	1			1	2		2	2	1	2	-3-
69	1				1		1	1	3		3
70	1	1	-1-		3				2		2
71	2		3		5				1	1	2
72	1	2	3	1	-7-		1	1	2	2	4
73		2	1	2	5				1		1
74	1	1	1		3						
75		2	1	1	4	1*	2	3	1	1	2
76		1	1		2				1	1	2
77	1	-1-	2		4	2*	3	5	1		1
78	2	1			3		2	2			
79	1	1			2	1	-2-	3	1		1
80		2			2		3	3	3		3
81							1	1			
82	-3-	4	1		8	1	1	2	1		1
83									1		1
84	2				2	4	1	-5-			
85											
86	1	1			2	1	2	3			
87											
88						1	2	3			
89	2				2	1		1			
90		1			1	2*	1	3			
91						-1-		1			
92		2			2	4*		4			
93											
94	6	1	1		8	10*	4	14			
95											

mid scores of this section are approximately two grades below the eighth-grade norms in spelling, reading, the thought phase of American history, and the fundamental operations in arithmetic, while in the information phase of both American history and geography and in the thought phase of both geography and arithmetic they are approximately three years below.

Surely no teacher of English would expect the pupils of this section, which is approximately a sixth-grade class in both mental age and attainment in spelling and reading, to do the type of work that is expected of the pupils of the A section. They might be expected to do fair seventh-grade work were their intelligence quotients not so low—all below 96. In algebra or geometry no high school teacher could hope to succeed with them. Nor could the high school teacher of American history hope to carry them beyond the achievement of seventh-grade pupils. The records of this class are just as significant for the teachers of other high school subjects as they are for the teachers of English, mathematics, and American history. Usually these pupils would be placed in sections with the pupils making up the A section. Is it any wonder that the mortality of the freshman class is so high? Under such conditions it could not be otherwise. If the freshman year is to be an extended mental test to prove the unfitness of these pupils to pursue the work of the high school, both the expense of the trial and the time of the pupils could well be saved. The trial and the inevitable failure will tend to do these pupils far more harm than good. It is a case for the high school either to refuse to accept them or else to take the wiser course of providing these pupils with courses of study adapted to their needs and simple enough to come within their range of comprehension, and also with the advice to elect them.

The main features that have been emphasized with regard to the D section are also characteristic of the C section, only, of course, to a somewhat less degree. An examination of the third columns in Tables 18 to 26 indicates that in the C section there is only one pupil above the average eighth-grade pupil in mental age. In spelling (Table 19) there are only three pupils above the eighth-grade norm, which is nearly two years below the mid attainment that should be expected of the A section. Only three pupils are above the eighth-grade norm in reading (Table 20), none are above in the information phase of American history (Table 21), only three are above in the thought phase of American history (Table 22), none are above in either the thought or information phase of geography (Tables 23 and 24), only five are above in the fundamental operations of arithmetic (Table 25) and only two in arithmetic problems (Table 26). Only in spelling, reading, and the fundamental operations of arithmetic are the mid scores of the C section less than a year below the eighth-grade norms. Even in these three phases of school work the C section is over two years below what should be expected of the A section. With such a record how little in the way of high school achievement can reasonably be expected of the pupils of this section in comparison with what should be expected of pupils of the capacities of those making up the A section. Nor can these pupils be retained in the elementary school until they do attain higher achievement standards to much if any better advantage than those of the D section. They, too, are already chronologically overage for the elementary school, only not so much so as the pupils of the D section. Not only would they be out of place among the younger pupils but for them there may be other phases of school work more important than those given in the elementary school and which can be far more effectively taught in the high school than in the elementary school.

What Standards of Achievement in the Elementary School Subjects Should the High School Expect? Under the changing conditions of entrance into high school both lower and more varied standards have undoubtedly been evolved. High school teachers are unquestionably correct in their assertion that the present freshman students are less adequately prepared to do high school work and less able to do it than earlier freshman classes. The more rapid promotion of the gifted pupils in the elementary school and the increasing enrollment of the less gifted account for the changed conditions. But no explanation can bring about a return of former conditions. Nor is a return to them desirable. In meeting the new conditions, however, what reasonable standards of achievement can be set up for high school entrance? If pupils of different mental capacities are in need of varied ranges of information and differing amounts of abilities from a social point of view, as teachers are coming to accept, then it becomes a matter of determining at what point in mental age and achievement individuals with different amounts of capacity should change from the elementary to the secondary school. At present there is practically no uniformity from one elementary school to another nor even from one school system to another. Of one thing we may be certain, there can be no single standard for all pupils but it would seem highly desirable to have reasonably common standards for pupils of similar capacity. At present these standards will have to be based on a consensus of opinion. Eventually they may be established experimentally. Until more adequate standards are set up than what are most widely representative of current practice, even these will be far more satisfactory than no standards at all. If the present mental age norms for the elementary school subjects are provisionally accepted and definite mental ages for pupils of different rates of gain in mental age and achievement are temporarily set up, these standards would then be open to criticism and experimental verification. Such a procedure would be but making definite and concrete what is now aimed at vaguely.

The Present Wide Variations in High School Entrance Standards Present a Potent Argument for Greater Definiteness. A glance through the mid scores of the A section of high school A in the first frequency column of Tables 18 to 26 indicates a wide disparity between the location of the mid mental age and the locations of the mid scores. In spelling, the thought phase of American history, the fundamental operations of arithmetic and arithmetic problems the achievement mid scores are fully a year below the class mental-age norms. They are more than two and a half years below in the thought phase of geography and more than three years below in the information phase of both geography and American history. In reading alone is the class score of the A section less than a year below the class mental-age norm and even in reading it is nearly a year below. Do such attainments represent what the high school should reasonably expect of the superior and gifted students?

In the content subjects of American history and geography the pupils of the D section surpass those of the A section in quality of work, or in the closeness with which the class scores approximate the class mental-age norms, from half a year to nearly two years. In no phase of elementary school instruction do they fall below the pupils of the A section in quality of work. In only two phases of instruction—spelling and the fundamental operations of arithmetic—do the achievement standards of the D section fall within a year of the class mental-age norms, and in no phase do they lie within a year and a half of the eighth-grade norms. Is it any wonder that the high school teachers find these pupils inadequately prepared for taking up the usual high school work of the freshman year?

How widely high schools differ in the composition of their freshman classes may be readily seen on comparing the frequency distributions of the other two high schools on Tables 18 to 26 with those of high school A. Of the sixty freshmen in high school B, only 9 or 15 per cent are below the mid pupil of high school A in mental age, as shown in Table 18. Only 23, or less than 22 per cent of the 105 freshmen in school A, are above the mid mental age of high school B. This is not due to the fact that high school A is admitting students at an earlier chronological age, nor is it due to any tendency of high school B to exclude the less capable pupils. The difference in the composition of the population in the two communities accounts for this marked difference in the mid mental ages of the two freshman classes. It is a difference, however, which must seriously affect the work of the high school. Not only is there a difference of over a year in the mid mental ages of the freshman classes in the two high schools but there is also a very significant difference in the mid intelligence quotients and in the mid achievement scores. Neither high school B nor high school C has to make provision for sections equivalent to the C or D sections in high school A. There are but very few pupils in either high school with mental ages lower than the lowest mental age in the B section of high school A. In no phase of instruction have any of the pupils in high school B as low scores as the lowest pupils in the B section of high school A.

High school C, the University High School at the University of Minnesota, does not represent the conditions found in any particular community but accepts as students pupils from different communities, with different school curricula and differing standards of attainment for graduation from the elementary school, as well as different conditions of instruction. Although no attempt is made in high school C to select the applicants for either intelligence or achievement, its freshman class is a few months higher in both range of mental ages and mid mental age than that of high school B and considerably higher than that of high school A. From the distributions of mental ages in these three high schools, it is obvious that the term high school freshman is a very indefinite one as far as mental age is concerned. In any one of the three high schools the range is at least five years. When the mid mental ages in the three high schools are compared with one another, the term typical or average high school freshman is also seen to have a variable content. In all three high schools the differences in mid mental ages of the A and B sections, into which the pupils might well have been distributed, is twenty months or more. The somewhat greater amount of overlapping in the case of high school B is due to the inclusion in its A section of eight seventh-grade pupils promoted directly into the high school. Four of the eight made somewhat higher mental test scores in a series of mental tests than they made on the Terman test of intelligence. That no mistake was made in this double promotion is evidenced by the fact that all eight pupils are standing in the upper half of practically all their high school classes.

How well the pupils entering these high schools were equipped for high school work may also be determined from an inspection of Plates 19 to 26. Taking the A sections, which differ only slightly from one another in mid mental age in the three high schools, it is apparent that the pupils in high school B are better equipped in spelling by a year than the pupils of either of the other schools. In reading the pupils of high school B stand higher than those of high school A by a year and higher than those of high school C by three months. In both the information and thought phases of American history the pupils of high school B surpass those of the other two high schools by approximately a year. The same relationship holds true in the case of the thought phase of geography and the fundamental operations of arithmetic, while in the information phase of geography and the thought phase of arithmetic the pupils of high schools A and C are surpassed by those of high school B to the extent of nearly two years. In comparing the achievement of the pupils in high schools A and C it will be seen that, on taking the difference in mid mental ages into account, those in high school A slightly surpass those in high school C in spelling, in the thought phase of American history, and in both the information and thought phase of geography and surpass them by a considerable extent in arithmetic—especially in the thought phase. In reading and the thought phase of history alone are they excelled by the pupils of high school C. The results of the comparison of the achievement mid scores of the A sections of the three high schools with one another suggest that the pupils of high school B are not only better equipped with information, skills and abilities to undertake high school work, but that they are also equipped with better habits of work and more effective methods of study, if not also with more impelling attitudes toward school achievement than the pupils of either high school A or high school C. The quality of work of the pupils of high school C, although they are largely drawn from the schools of two large cities, is below that of the pupils of high school A, as well as markedly below that of the pupils of high school B. Either the superior pupils in the larger city schools are not being as effectively taught as they are in the smaller cities, or else high school C is drawing pupils on account of their inferior quality of work in the elementary schools.

A similar examination of the B sections, in which the mid mental ages again differ but slightly in the three high schools, shows that the pupils of this section in high school B surpass those in high schools A and C by two years in spelling, by over a year and a half in reading, and by from nearly a year to over a year and a half in the information and thought phases of both history and geography. In the fundamental operations of arithmetic and in arithmetic problems alone are the pupils of high school A unexcelled by those of high school B. The pupils of high school C are surpassed by those of high school B, however, by over a year in the fundamental operations of arithmetic and by over two years in arithmetic problems. In spelling and in the thought phase of both history and geography the pupils of high school A have about the same preparation and quality of work as those of high school C; in reading and the information phase of geography they are slightly better; in arithmetic they surpass the pupils of high school C very decidedly—by a year in the fundamental operations and by two years in arithmetic problems. In the range of information in American history alone do the pupils of high school C surpass those of high school A. The results of the intercomparisons of the B sections thus clearly support the inferences that were drawn from the intercomparisons of the A sections. There is no typical high school freshman. High schools differ too widely in their composition for his isolation. Nor are the same achievement standards feasible of attainment from one high school to another unless the high schools differ very widely in the quality of their work.

What has been accomplished for the elementary school in the way of devising scales for measuring school achievement and in determining mental age norms will eventually be done for the high school. Carefully devised group mental tests are already available and the achievement scales are being devised as rapidly as there is a demand for them. With the use of such instruments educational and vocational guidance alike will come to assume a more scientific procedure. Students will not only be guided in selecting courses of study in harmony with their interests and capacities but they will be able to see just how much they will need to accomplish in each phase of work in order to undertake successfully the next more complex phase. Examinations will come more and more to be used as means of determining whether or not adequate abilities have been acquired for definite purposes rather than as hurdles to be cleared with the least preparation.

CHAPTER XVI

MEASURING THE ACHIEVEMENT OF A SCHOOL SYSTEM

In Evaluating a School System the Measurement of Achievement Is a Fundamental Element. The factors more commonly taken into consideration are the adequacy of the plant, the personnel of the teaching population, the nature and amounts of the expenditure and the sources of revenue that have been tapped. That adequate housing conditions and equipment should be provided no one questions. That higher salaries enable a school system to secure better trained and more gifted teachers is hardly to be doubted. That wastefulness needs to be eliminated and revenues increased is generally conceded. So much has been accomplished in these respects that the product of the schools is frequently overlooked or else crudely measured in terms of pupil retention. Yet far more important than retention is the achievement of the students. The real success of a school system may depend to a large degree upon the quality of the plant, the efficiency of the teaching staff and the availability of adequate funds, but it is measured neither by its retention of students nor size of classes. Its effectiveness is measured in terms of its educational achievement: the ranges of information, the abilities and skills, and the habits of work and of study that have been acquired by the students. Where measurements of achievement have been attempted, as in school surveys, the need for better trained teachers and more adequate supervision have frequently been pointed out. Even specific changes in the instructional conditions have occasionally been suggested. Yet, on the whole, we are in the habit of adopting new methods, new procedures and new values in education on the basis of enthusiasm or economy rather than on the basis of increased achievement. That educational achievement has been difficult of measurement is only too true; that great progress has been made during recent years in facilitating the measurement of educational achievement is equally true, but that there is a pressing need for a wider practical use of measurements is also true.

Marked Improvements Have Been Made in the Materials for Making Educational Measurements. From its simple beginnings in the measurement of arithmetic and spelling abilities and the quality of handwriting, the achievement survey has been gradually brought into wider use as well as to a higher plane of usefulness. The introduction of mental tests for measuring the general mental ability of pupils has made possible the determination of capacity norms for achievement tests. The extension of the range of the tests to include practically every phase of elementary school instruction has made more complete surveys feasible. The devising of many forms of each scale, approximately equal in difficulty and equivalent in content, has made re-surveys practicable. The development of individual and class record cards, distribution sheets and quotient charts has made the tabulation of the results a simple process. The establishment of bureaus of research and reference for supervising the collection of the data, interpreting the results, and offering remedial suggestions has added immensely to the usefulness of the process. With the materials now available the educational achievement of a school system can be as readily calculated as the profits made by a business organization. The attainments of any school system may be compared with definite norms or with those of other school systems. The amount of improvement that results from any change in the school program or practice may be quantitatively measured; likewise the effect of putting into practice any recommendations growing out of an achievement survey can now be determined quantitatively.

The Usual Survey of School Achievement Has Definite Limitations. It is frequently carried out by people brought in for that purpose. The scoring of the tests and frequently the giving of them is done by the outside staff. While the results may be more accurate and may seem fairer, the local teaching force is left without the real insight and interest that comes from taking a vital part in the process. As a general rule, the results of the surveys have been expressed in tables giving the medians of achievement for the school system as a whole or at most for classes of schools. In a few cases only has the work of each class or even of each school been individually evaluated and detailed suggestions made for improving the instruction. Even when this is done the results are usually available too long after the measurements have been made to be of any practical value.

In many cases genuine attempts have been made to carry out the recommendations of the survey committees, but the gain made by doing so has seldom if ever been determined by the making of a similar survey after the recommendations have been put into effect. Nor need it be surprising that re-surveys have not been made. The failure to have done so does not necessarily indicate a lack of interest in the outcome. Usually the outside surveying force has become dispersed. Seldom has a series of tests been used of which duplicate copies are available. The teaching force itself received no training in the making of the survey that would help them in making a re-survey. They were no better equipped to make a re-survey than they were to make the first survey. Hence, valuable as the typical survey of achievement may have been, there are numerous possibilities of improvement in the making of it.

Occasionally in connection with a school survey some schoolman has presented a request for the scores made on the tests by the pupils in his charge. Such requests give a clue to the real value of a survey: namely, enabling the schoolman to deal more intelligently with individual pupils, for, after all, improvement in the mass is based upon improvement in individual cases. The achievement of a class is raised only as there is a gain in the achievement made by the individual pupils of the class. Unfortunately, even in cases where scores for individual pupils can be returned to the school, these scores are seldom in such shape that they are usable for individual diagnostic purposes. To give a clinical record of each pupil's educational conditions and his educational symptoms should be one of the outstanding purposes of any survey of school achievement. With such a record at hand it is feasible to make remedial suggestions. But the function of the survey does not stop here. There should be re-examinations to determine the amount and direction of the educational changes that follow upon putting the suggestions into effect. This of course necessitates the use of measuring instruments of known reliability, also of instruments that can be used over and over again or else of instruments so similar in their readings that they may be used interchangeably.

The Selection of Tests for an Achievement Survey Is an Important Matter. The very first step in a survey of school achievement is the selection of a series of tests with which remeasurements may be made. In the case of most of the achievement tests this means that duplicate tests must be available. In the ordinary standardized test the duplicate tests can seldom be relied upon to give similar readings, due to the fact that the tasks in the tests are scattered along the range at uneven intervals; that is, bunched up at certain places in the range and scattered along thinly at other places. An examination of Plate 60, giving the distribution of tasks taken from Dvorak's original General Science Test, from which the tasks were selected for the scales, shows the condition that may be expected in many ordinary standardized tests. It was this condition in the author's own early American history scales that gave different mid scores when the duplicate tests were used on the same group, and that made their revision into the present series of American history scales a practical necessity. On Plate 61 are contrasted the spacing of the tasks on Dvorak's finished General Science Information Scale S2 and the spacing of the tasks on a test consisting of every tenth task, beginning with the third, in the distribution given on Plate 60. While the spacing of tasks on the latter test is superior to the spacing of tasks on the usual examination, only a casual glance is necessary to show the unevenness of the spacing, to show that the difference between a score of 2 and a score of 5 is four and a half times the difference between a score of 12 and a score of 15, to show that a difference between a score of 21 and 24 is only one third of the difference between a score of 26 and a score of 29. Nevertheless, we evaluate the achievement of pupils in school with far cruder instruments when the usual teachers' examinations are employed.

The educational scales, whether of the type like the various extensions or supplements of the Hillegas Scale for measuring English composition or of the type like the author's American history scales or the Buckingham scales for arithmetic problems,

PLATE 60

Number of tasks in Dvorak's original general science test located at each difficulty Value

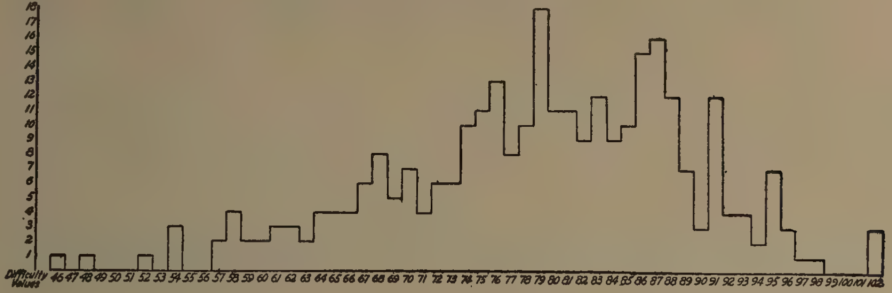
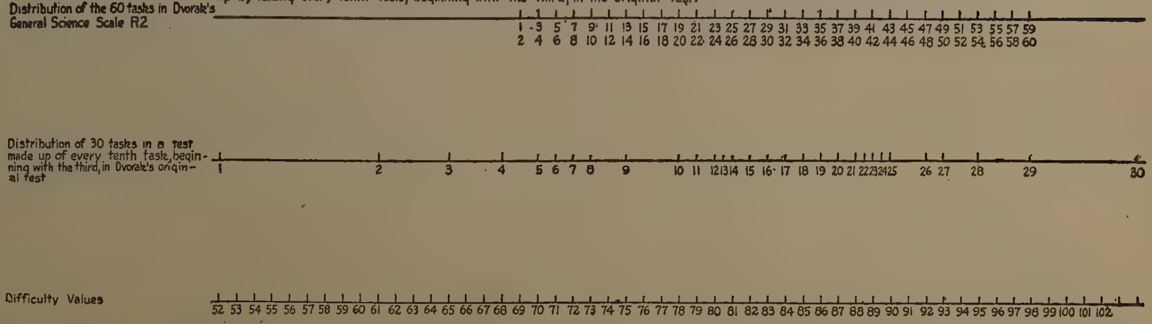


PLATE 61

Distribution of tasks according to difficulty values on Dvorak's General Science Scale R2 and on a test made up by taking every tenth task, beginning with the third, in the original test.



give as accurate comparable measures of educational achievement as it is feasible to obtain at the present time. In addition, the reliability of the educational scale scores is definitely known. Other characteristics that make their use advisable are that they are flexible, that the scores have visualizable meanings, and that the score units are approximately equal throughout the entire range. By flexibility is meant that as new material is introduced into the curriculum new tasks may be substituted in the scales for old ones of the same degree of difficulty. The scores have meanings that can be visualized just as an inch on a foot rule may be visualized. One may look at a composition of quality 55, for instance, and see exactly what it looks like, or he may note the actual words that normal pupils of the eighth grade can spell with a correctness of fifty per cent. As the score units in the scales are some measure of the variability of the group, such as the semi-interquartile range or the standard deviation, scale scores and scale gains are comparable with one another.

The Purposes of an Achievement Survey Determine by Whom It Should Be Made. With the introduction of a research bureau into a school system much of the survey work formerly done by outside specialists can now be undertaken within the school system itself. In many communities the lack of clerical assistance limits the amount of testing that may be carried on without calling in the co-operation of the teaching force. This co-operation of the teaching force, sometimes viewed with suspicion and misgivings, is the one thing essential to insure a successful use of the results of a survey for improvement of instruction. The teachers within a school system may be as readily instructed how to give and score the educational tests and how to enter the results upon permanent records as college classes in educational measurements. Besides, the added information which the teachers possess about the habits and social life of the pupils is of the greatest importance in the interpretation of the scores made by individual pupils. At the same time, the class summaries will indicate to the teacher the quality of work that is characteristic of her class and the difficulty of material that can be successfully used with it, just as the individual records indicate what the individual pupil has accomplished and what may reasonably be expected of him. With such clinical records in hand, made significant through the insights gained in giving the tests, in scoring the tests, and in working up the individual and class records, the teacher is in a position to evaluate her own methods of teaching and her own methods of dealing with individual children. The tests when put into the hands of the teacher trained to use them intelligently become clinical instruments for measuring the amount of change that occurs educationally in individuals as a consequence of using certain methods of instruction or certain materials of instruction. Instead of being a means in the hands of a supervisory force for passing judgment upon the quality of a teacher's work, which unfortunately they have been in some danger of becoming, the test records should form the basis for the teacher's going to the supervisor and asking for exact information as to how to deal intelligently with the situation she finds in her class. Such an attitude on the part of teachers cannot help but develop a more professional relationship between the teachers and the supervisor. Instead of being thought of as a critic and judge, the supervisor will come to be held in higher esteem as an expert. The possession of a wide range of scientific information in education and the keen capacity for analyzing classroom situations, for picking out the significant elements in them, and for suggesting what should be done or what may be tried and tested out experimentally will, of course, be essential. The making of this use of the movement toward more exact measurement in education will also inevitably lead to the development of better situations for stimulating the professional growth of teachers than now exist in many instances.

While the most important purpose of an achievement survey probably consists in acquainting the teachers with the actual educational conditions existing in the school system, the realization of its strong and weak points as well as of its present standards of attainment, there are several other purposes that must be considered as of more than minor importance. The evaluation of the quality of work of each school, of each group of pupils within the school, and of each pupil within the group is essential for the introduction of any remedial measures looking toward changing the emphasis from one phase of school work to another, for securing the most adequate classification of pupils for instructional purposes or for dealing intelligently with individual deficiencies. Such purposes as these must be kept in mind in selecting a series of tests for use in making a survey. It was to meet just such purposes that the educational scales used in the illustrative surveys were brought together or specially constructed, that a set of individual and class record cards were worked out for recording and making the widest use of the pupils' scores, that an age and quotient chart was devised for economically determining the derived measures and that distribution and classification sheets were planned for the tabulation and summarization of the scores.

Preparations for an Achievement Survey. Wherever the results of a survey are to be used for classification purposes or as a basis of assigning school marks not less than two group mental examinations should be given. Where the mental ages derived from these are found to differ considerably a third should be used, or, better still, an individual mental examination should be given if this is feasible. The tests should be given near enough toward the end of the semester or term so that the results may be used in the assignment of the school marks, whatever basis—achievement or quality of work—is used. Not more than two tests should be given on one day, nor should the series stretch out over more than two weeks. The mental tests should be given at least a week apart. Provision should be made for all those who miss the mental test in the same school to take it at the same time, as the giving of it involves all of a teacher's time during the process. The test blanks, keys for scoring, and materials for tabulating the results should be ordered long enough in advance to insure their being on hand at the desired time.

A few days before the survey is to be started the teachers should be called together for a conference and for instructions. Once the purpose and plan of the survey of achievement has been made clear to them a competent and tactful director should be selected to carry it forward where there is no bureau of research or where the superintendent or principal does not supervise it personally. A detailed set of directions for giving the tests selected for use should be placed in the hands of each teacher along with the test papers themselves. Although specific directions for giving each test accompany each package of test papers, considerable confusion will be avoided by combining the general directions for giving them into one folder, which should also give the date and period at which each test is to be given, so that conditions under which the various tests are taken by the pupils may be uniform throughout the school or school system. The following set of directions given to students in classes in educational measurements will serve as an illustration.

GENERAL DIRECTIONS FOR GIVING THE TERMAN GROUP TEST OF MENTAL ABILITY AND THE EDUCATIONAL SCALES IN SPELLING, READING, HISTORY, GEOGRAPHY AND ARITHMETIC

General Directions for Giving the Terman Group Test of Mental Ability. Before attempting to give the Terman mental test to a group of pupils read over the booklet of directions until you are thoroughly familiar with them. Give the test to some of your friends as a test of your mastery of the directions. In giving the test keep the school room conditions as normal as possible but follow the printed directions exactly. If some pupils are absent at the period the test is given the group, see that they are given the test under conditions as nearly identical with those under which the group took the test as it is feasible to make them. Be sure that every pupil writes his name on the test paper. Keep the time for each of the tests exactly. The minute hand of your watch should be set so that it is on the minute mark when the second hand is exactly at the 60. Give the signal "start" immediately upon finishing the reading of the directions at the top of the test. Take the time in minutes and seconds at which you say "start" and put it down on a piece of paper. Add to it the time required for the test so that you will know exactly when to say "stop." Do not wait to say "start" until your watch hands get to a convenient place, as the pupils will not wait for you. Do not neglect to put the time down, as any disturbance is likely to cause you to become confused as to how much time has elapsed. Do not accept any questions after you have said "start." Before passing out the booklets see that each pupil has a well sharpened pencil to work with and another to use in case of a broken point, so that time may not be lost in looking for or sharpening a pencil. Collect the booklets as soon as the last test is finished. Look to see that each booklet has the pupil's name on it. Separate the tests for the boys and girls and arrange each set in alphabetical order. Make note of any pupils who are absent so that they may take the test at the earliest opportunity. Tie the booklets together, with a note giving the school, grade, test, date given, by whom given, and the names of the absent pupils.

General Directions for Giving the Spelling Scales. Use Scale A. (Any other scale that may be selected.) Be sure that the right division is used for the grade to be tested. Make certain that you know the correct pronunciation of the words. Have the pupils carry out the directions, particularly those for numbering the blanks, exactly as they are printed on the spelling scales, otherwise confusion and much extra work will be involved in the scoring. Pronounce the words distinctly but not in a give-away fashion. Pronounce the word a second time whenever a pupil does not hear it owing to some distraction. Do not go through the list faster than the pupils can write well. Caution them to dot their i's so they will not be mistaken for e's. Give the number of the word as well as the word, so that the pupils will know exactly where to write it. Collect the papers as soon as they are completed. Look to see that each paper has the pupil's name on it. Separate the girls' papers from those of the boys and arrange each set in alphabetical order. Note the pupils who are absent so that they may be given the test later. Tie the papers together, with a note giving the school, grade, test, date given, by whom given, and the names of the absent pupils.

General Directions for Giving the Thorndike-McCall Reading Scale. Distribute test booklets. Have the blanks filled. Read the paragraph on the first page aloud while the pupils follow silently. Read the first question aloud. Have it answered orally and then in writing by the pupils. Do the same with the other three questions. When this has been done tell the pupils to "begin," putting down the time when you say it. Stop the pupils thirty (30) minutes after saying "Begin." Give no further help. Collect the papers; look to see that each booklet has the pupil's name on it; separate the boys' papers from the girls', and arrange each set in alphabetical order. Make a note of the pupils who are absent, so that they may be given the test at the first opportunity. Tie the booklets together, with a note giving the school, grade, date given, by whom given, and the names of the absent pupils.

General Directions for Giving the American History Information Scale and the American History Thought Scale. Be sure that you have the right division for the grade to be tested. Division 2 of Thought Scale R may be used in the sixth grade. After distributing the papers of either scale tell the pupils to fill in the blank spaces. When this has been done, read aloud the paragraph under "Directions" on the front page while the pupils follow silently. Note the time when you say "start." Stop all the pupils forty (40) minutes after saying "start," as 40 minutes are required for each scale. Have the pupils hand in their papers as they finish, advising the first ones done to look over their papers to see that they have omitted nothing. Look to see that each paper has the pupil's name on it as it is handed in. Separate the boys' papers from the girls' and arrange each set alphabetically. Should any pupils be absent, make a note of their names and give them the earliest opportunity to take the test missed. Tie the tests together, with a note giving the school, grade, test, date given, by whom given, and the names of the absent pupils.

General Directions for Giving the Geography Information Scale and Geography Thought Scale. Make certain that the right division is available for the grade to be tested. After distributing the papers of either scale tell the pupils to fill in the blank spaces. When this has been done, read aloud the paragraph under "Directions" on the front page while the pupils follow silently. Note the time when you say "start." Stop all the pupils forty (40) minutes after saying "start," as 40 minutes are required for each scale. Have the pupils hand in their papers as they finish, advising the first ones done to look over their papers to see that they have omitted nothing. Look to see that each paper has the pupil's name on it as it is handed in. Separate the boys' papers from the girls' and arrange each set alphabetically. Should any pupils be absent, make a note of their names and give them the earliest opportunity to take the test missed. Tie the tests together with a note giving the school, grade, test, date given, by whom given, and the names of the absent pupils.

General Directions for Giving the Woody Arithmetic Scale (Van Wagenen Revision). Be sure that the right division is used for the grade to be tested. After passing out the papers, face down, tell the pupils to turn them over and fill out the blank spaces at the top of the page. As soon as this has been done read the directions aloud from the test paper while the pupils follow silently. Caution the pupils to work neatly and to make their figures clearly. Have no other paper on the desks. Then say "start." Have the pupils hand in their papers as they finish. Advise the first ones done to look over their papers to see that they have omitted nothing. Look to see that each paper has the pupil's name on it as it is handed in. At the end of 30 minutes collect all papers. Separate the boys' papers from the girls' and arrange each set alphabetically. Should any pupils be absent, make a note of their names and have them take the test at the first opportunity. Tie the tests together, with a note giving the school, grade, test, date given, by whom given, and the names of the absent pupils.

General Directions for Giving the Buckingham Scale for Arithmetic Problems. Be sure to use the right division for the grade to be tested. Distribute the papers face up and tell the pupils not to turn them over or open them. Distribute no other paper. After the pupils have filled in the blanks at the top of the front page read aloud the long paragraph in quotation marks while the pupils follow silently. Stop the pupils at the end of one hour (60 minutes), after saying "start." Have the pupils hand in their papers as they finish but tell them to look over their work and be sure that they have tried all the problems, and put in the dollar sign and decimal point where an answer is in money. As the papers are handed in look to see that each paper has the pupil's name on it and that the answers have been copied in the proper places—in the little rectangles. Separate the boys' papers from the girls' and arrange each set alphabetically. Should any pupils be absent make a note of their names and have them take the test at the first opportunity. Tie the tests together, with a note giving the school, grade, test, date given, by whom given, and the names of the absent pupils.

General Directions for Collecting English Compositions. Provide the pupils with paper and pens. Tell them to write their names, their grade, and the date on the back of one sheet of paper. When everything is in readiness for work, tell the pupils, "You are to have thirty minutes in which to write a composition. The first fifteen minutes may be used for making a rough draft of the theme and the last fifteen minutes for polishing up the language and copying it in ink on the sheet on the back of which your name is written. Use more than one sheet if you need it but write your name on the back of each sheet." The topic should then be announced. The selection will depend somewhat upon the scale that is to be used for evaluating the quality of the composition. No announcement of the topic should be made beforehand. The same topic should be used throughout the survey group. Five minutes before the time is up the pupils should be told, "You will have five minutes more in which to complete your theme." At the end of the thirty minutes collect the papers, looking to see that the pupil's name is on the back of each sheet as they are handed in. Separate the boys' papers from those of the girls and arrange each set in alphabetical order. Should any of the pupils be absent, make a note of their names and give them the earliest opportunity to write the desired theme. Tie the papers together with a note giving the school, grade, topic assigned, date given, by whom given, and the names of the absent pupils.

General Directions for Collecting Specimens of Handwriting. Some days before the handwriting test is given, have the pupils thoroughly learn or review Lincoln's Gettysburg address. At the time the writing test is given have a copy of it on the board so all may see it in case any one forgets a part of it. Provide each pupil with a sheet of lined paper and a good pen. See that there is ink available in the inkwells. Have each pupil write his name, grade, and date of the test on the back of the sheet. When everything is in readiness announce to the pupils, "We are going to have a short test of penmanship. Write from memory 'Lincoln's Gettysburg address.' If you forget any part of it, it is on the board but spend no more time looking at the board than you absolutely have to as it will lower your score. Write at your ordinary rate, as both quality and rate count in your score. Take penholders, dip pens in ink, hold them up, begin." Take the time at which they start, just as in giving a mental test. Add two minutes to it and put it down on a piece of paper. When the time is up say, "Stop, pens up, lay them aside." Collect the papers, watching to see that each pupil has his or her name on the back of the paper when it is handed in. Separate the boys' papers from those of the girls and arrange them alphabetically. Should any of the pupils be absent, make a note of their names and give them an early opportunity to take the test. Tie the papers together with a note giving the school, grade, date given, by whom given, and the names of the absent pupils.

Scoring the Tests. The next step in the survey, of course, is the training of the teaching force to do the scoring. Although each package of tests is accompanied by a detailed key for scoring the tests and calculating the scores, it is very essential that items in each test on which errors in scoring are likely to be made should be called to the attention of the teachers before the scoring is started. Again a conference is advisable. For the director of the survey to have present two or three assistants, who have been previously trained to do the scoring, to check up the first few papers scored by each teacher will practically eliminate the necessity of later re-scoring any sets of tests. In the scoring process fewer errors will be made and greater uniformity of results obtained if the first few questions are scored for all the tests and then the next few, and so on until all the tasks have been completed. Still greater economy would be achieved if all the tests of any one kind were scored by the same person. Any advantage in economy that might be attained by such a procedure would be more than offset, however, by a growing lack of interest due to the monotony of doing the same task too many times and by the lack of opportunity for each teacher to learn how to score each test and to see exactly what each of her own pupils did on the test.

The three outstanding kinds of errors that are likely to be made by the teachers are too great leniency in marking the papers, giving the pupil the benefit of the doubt when any question of interpretation is involved; too great rigidity in marking, failure to give credit to any answers not given in the key when the key contains only representative answers; and failure to follow exactly the directions given for scoring, due either to a too hasty reading or to a faulty reading of the directions for scoring.

To forestall the making of these errors the author's "A Teachers' Manual in the Use of the Accomplishment Educational Scales"[1] may be placed in the hands of each teacher. This includes samples of the scales, with answers to the tasks just as they have been written by pupils. Each sample paper is scored according to the key of answers accompanying the package of tests. In this way illustrations will be available to indicate just how different answers given by the pupils should be scored and just how the scores in the different scales should be calculated. A careful reading of this manual will thoroughly familiarize the teachers with the scoring of the scales and will also suggest in the explanations the answers to whatever questions are likely to arise regarding the scoring.

Before scoring the compositions and specimens of handwriting some practice should be afforded in the use of the scales. For the Thorndike Extension of the Hillegas Scale and the Nassau County Supplement of the Hillegas Scale, a set of practice themes has been prepared by Professor E. L. Thorndike and may be obtained from the Teachers College Bureau of Publications. Sample sets for practice are included with the Hudelson English Composition Scale and the Van Wagenen English Composition Scales. Each specimen should be scored by at least from three to five judges, depending upon their ability to rate the specimens, and the mid-rating taken as the pupil's score.

As soon as the scoring of each set of test papers is completed two or three papers should be selected at random from each set for re-scoring, either by one of the assistants or by one of the other teachers undergoing the training. In this way any constant errors may be pointed out at once to the person who scored the set of papers. Whenever sets of papers are found containing errors they should, of course, be re-scored by the person doing the original scoring. This is advisable, not only to secure accurate scores for each pupil, but to insure an avoidance of the same kind of error in the scoring of other similar test papers. For all sets of papers in which errors in scoring are not found in the randomly selected specimens, the scores should at once be entered upon permanent record cards.

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[1] M. J. Van Wagenen, "A Teachers' Manual in the Use of Accomplishment Educational Scales," Public School Publishing Company, Bloomington, Illinois.

In order to save annoyance and trouble in looking up in various sources the tests and scales that may be used in connection with the survey plan outlined and illustrated in the preceding pages a tentative list of such tests and scales, together with the names of the publishers, are given below. Such a list must be considered tentative, however, as any mental test on which the mental ages coincide with those of the Stanford Revision of the Binet-Simon Individual Mental Examinations will be found adequate in so far as it is reliable and possesses a reasonably high predictive value in estimating mental capacity for school achievement. Also new achievement scales will appear from time to time, which, if built up by the same method as was used in constructing the Thorndike-McCall reading scales or by the same method as was used in constructing the Posey-Van Wagenen geography scales and the Van Wagenen American history scales, will be found to fit into the present plan very neatly. An illustration of this is found in the Morrison-McCall spelling scales. These were published after the age and quotient chart and the sheets containing the mental age and grade norms referred to in this work had been completed and in use in several surveys. The author's mental age norms are practically identical with the mental age norms given on the norm sheets and the chart for the Thorndike-McCall reading scales, which were worked out by the same method as the Morrison-McCall spelling scales. To use these more recently derived spelling scales, if they are preferred to the other series listed, one needs only to use the norms for the Thorndike-McCall reading scales instead of the norms for the other spelling scales in finding the mental age and grade variations and in finding the spelling ages, spelling quotients and achievement quotients in spelling. Only such scales are listed as have been found most useful in general surveys of school achievement.

LIST OF MENTAL TESTS AND EDUCATIONAL SCALES USED IN THE MINNESOTA SCHOOL ACHIEVEMENT SURVEYS.

Grades 6, 7, and 8.

Mental Tests:

Terman Group Tests of Mental Ability—World Book Company 2126 Prairie Ave., Chicago, Ill.
Examination Form A or Form B for grades 6, 7, and 8.

National Intelligence Tests—World Book Company. Scales A and B of either form 1 or form 2 for grades 6, 7, and 8.

Spelling Scales:

Van Wagenen Spelling Scales. Scales A, B, C, D, or E. Public School Publishing Company, Bloomington, Ill.
Use Division 2 for grade 6 and Division 3 for grades 7 and 8.

Morrison-McCall Spelling Scales—World Book Company.
Any one of the eight scales for grades 6, 7, and 8.

Reading Scales:

Thorndike-McCall Reading Scales—Teachers College Bureau of Publications, 525 West 120th Street, New York City, or the Public School Publishing Company.

Any one of the ten scales for grades 6, 7, and 8.

American History Scales:

Van Wagenen American History Scales (Revised Edition).
Teachers College Bureau of Publications, or the Public School Publishing Company.
Information Scales R or S, division 1 for grades 6 and division 2 for grades 7 and 8.

Thought Scale R, division 2 for grades 6, 7, and 8.

Geography Scales:

Posey-Van Wagenen Geography Scales—Public School Publishing Company.

Information Scales R or S, division 1 for grade 6 and division 2 for grades 7 and 8.

Thought Scale R, division 2 for grades 7 and 8.

Thought Scale S, division 1 for grade 6.

Arithmetic Scales:

Woody Arithmetic Scales (Van Wagenen Revision) for measuring the fundamental operations—Public School Publishing Company.
General Scales R or S, Division 2 for Grade 6 and Division 3 for grades 7 and 8.

Buckingham Scales for Arithmetic Problems (with special method for scoring contained in the author's "A Teachers' Manual in the Use of the Accomplishment Educational Scales," Public School Publishing Company.
Forms I and II, division 2 for grade 6 and division 3 for grades 7 and 8.

English Composition Scales:

- *Thorndike Extension of the Hillegas Scale and the Nassau County Supplement to the Hillegas Scales—Teachers College Bureau of Publications.
- *Hudelson English Composition Scale: *Lewis English Composition Scales; and *Van Wagenen English Composition Scales—World Book Company.

Handwriting Scales:

- Thorndike Handwriting Scale, Teachers College Bureau of Publications.
- Ayres Handwriting Scale—Gettysburg Edition. Russell Sage Foundation, New York City.

Drawing:

- *Carey-Kline Drawing Scales—Johns Hopkins Press, Baltimore, Md.

The question as to how extensive an achievement survey should be undertaken depends very largely upon local conditions. At least one group mental test is essential, two are advisable. Again, only such phases of the work of the school need be measured as are stressed in the particular grades surveyed. For example, where geography is not taught in the eighth grade it may seem advisable to omit this subject entirely from the eighth-grade series of tests. For the same reason the American history tests may be omitted from the seventh grade in many school systems. These, however, are of value in giving the teachers of the eighth grade an idea of what the children already know and can do at the beginning of the eighth grade. On the whole, it will undoubtedly be found more satisfactory to measure the work of one grade rather thoroughly than to make only partial measurements in several grades.

Were it not for the fact that re-surveys are so seldom made, it would seem unwarranted to call attention to the value of second, third and fourth surveys in a series. Such re-surveys of achievement should take place probably not oftener than every half year, nor less often than at the end of each school year. In the re-surveys it is seldom necessary to give a second series of mental tests unless it be for purposes of high school classification. In the re-surveys in the elementary school or the junior high school the mental age can be determined from the intelli-

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* These scales were not extensively used owing to limitations of the survey, not because of any limitations of the scales.

gence quotient and the chronological age for any date by simply reading the Age and Quotient Chart backwards, as explained in the directions. As the intelligence quotient is a fairly stable measure when determined from more than a single mental test, it would seem advisable to give two or more mental tests in connection with the first survey and then calculate the mental ages from the average intelligence quotients at each subsequent survey of achievement.

CHAPTER XVII

ORGANIZING THE DATA OF AN ACHIEVEMENT SURVEY

Convenient Blanks on Which to Record the Data Are a Practical Necessity. Both the mental tests and the achievement scales have come into wide use. In very few of the many schools that have used the tests are the results recorded in such a way that they can be readily interpreted or consulted. With each package of tests is included a class record sheet for the scores made in that test or scale. These are frequently filed away for future reference but they are seldom consulted for the scores of individual pupils. To look up a pupil's scores in several tests through a file of class record sheets requires too great an expenditure of time and patience. Furthermore, it is only when such records are brought together on a single card for each pupil and brought together in such a way that the pupil's variations from established norms are easily recognizable, that they possess any permanent value or serve any fundamental purposes. A permanent record card like that on Plate 62 but large enough to be readily filled in and easily read is essential for effective preservation of a pupil's educational measurements through a series of years. This particular card is 8 by 10½ inches and is printed in such a way that it can be readily folded into a regulation size filing card 5½ by 8 inches, with the name and grade left exposed for ease of finding in a file. At the top of the card are spaces for recording such personal data regarding the child as may be helpful in interpreting his test scores. In the top row of each large square are spaces for entering the names of the tests or scales used. In the second row of small squares are spaces for the scores made by the pupil. In the third row the amounts by which the pupil's scores vary from the norms for his mental age may be entered. In the fourth row are spaces for recording the amounts by which his scores vary from his

PLATE 62

Name M 5 6 7 8 9 BA BA BA BA BA Sex Grade Born Mo. Day Yr. Age 14_ 6 Yr. Mo. on Date 19

Parent or Guardian Address Telephone Occupation

Born Where? Nationality of Father Mother Years in school before entering grade 6, k'g'n not included		Intelligence					Intelligence					1. Spelling					2. Reading, Th.-McC					3. Reading					4. History Information					5. History Thought				
		Test	Score	Men. Age	Grade Var. in months	Men. Q.	Test	Score	Men. Age	Grade Var in months	Men. Q.	Scale	Score	M.A. Var. x 1½*	Grade Var x 1½*	Ach. Q.	Scale	Score	M.A. Var. x 1½*	Grade Var x 1½*	Ach. Q.	Scale	Score	M.A. Var.	Grade Var	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.
Grade 7B	Test	Ta										B3					2					Ha					R2					R2				
	Score		83										54½					58					70					78					81			
Date	M.A. Var.			13-6										−2					+5					−2					−2					+1		
Age	Grade Var.				+6										+½					+8					+1					+1					+4	
14_6	Quotient					93										96					106					97					97					101
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

		6. Geography Information					7. Geography Thought					8 Arithmetic Add.Subt.Mult.Div					9. Arithmetic Add.Subt.Mult.Div.					10. Arithmetic Problems					11. Vocabulary					12. Handwriting				
		Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale.	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	M.A. Var.	Grade Var.	Ach. Q.	Scale	Score	Grade Var.	Rate	Grade Var.
Grade	Test	R2					R2					R3										II3														
	Score		76					84					78										72													
Date	M.A. Var.			−4					+4					−2										0												
Age	Grade Var.				−1					+7					+1										+3											
—	Quotient					95					104					97										100										
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			
Grade	Test																																			
	Score																																			
Date	M.A. Var.																																			
Age	Grade Var.																																			
—	Quotient																																			

grade norm. The fifth row is for entering some such measures of the pupil's quality of work as his achievement quotients. The diagonal plan of recording the items renders them easy to isolate in the rows and easy to compare in the columns from one survey to the next. At the left side of each row of large squares, of which there are four for four successive surveys, are spaces for recording the grade, date and chronological age of the pupil at the time each survey is made.

The Process of Recording the Scores Should Be a Simple One. On this card the name of the test or scale used is entered in the first little square by a letter and number indicating its name and the form or division number. Thus on Plate 62 the Ta under "Intelligence" indicates that Form A of the Terman Group Test of Mental Ability was used; the B3 under "Spelling" indicates Scale B, Division 3, of the Van Wagenen Spelling Scales. Had the second scale in the Morrison-McCall series of spelling scales been used it would have been indicated by M2. Under "Reading, Th-McC" the 2 indicates that Form 2 of the Thorndike-McCall Reading Scales was used. In the large square provided for each of the educational scales available for measuring the achievement of the pupils in the elementary school and the junior high school, the name and division number may be readily designated. In the second row of small squares and in the space just to the right of the test or scale identification the score made on the scale should be recorded. Thus the boy whose scores appear on Plate 62 made a score of 83 in the Terman Group Test of Mental Ability, 54½ in the spelling scale and 58 in the reading scale. To avoid confusion and loss of scores, they should be entered on the permanent record cards as soon as the scoring of the tests is completed and checked for accuracy.

Such Significant Measures as the Amounts by Which a Pupil Varies from the Norms for His Grade and His Mental Age Are Readily Determined on the Permanent Individual Record Cards. For recording the amount by which the pupil's scores vary from the norms for his mental age the middle little squares should be used. In the middle little square under "Intelligence" on Plate 62 there is recorded the mental age corresponding to the mental test score. This mental age may be taken directly from the Age and Quotient Chart to be described later. The second large square headed "Intelligence" provides for recording the score and mental age when a second mental test is given. The mental age variations that are to be entered in the middle little squares under the achievement scales are found by folding over a sheet of norms like that on Plate 63 just above the pupil's mental age. The norms on this sheet, which just fits the card in width, are arranged to match up with the location of the scores entered on the card. The mental age variations are then found by subtracting the norms from the corresponding scores. Where the pupil's score is higher than the norm this is indicated by putting a plus sign in front of the variation. When the pupil's score is lower a minus sign is used to indicate it. As the units on the spelling scales and the Thorndike-McCall Reading Scales are approximately one and a half times as large as those on the other scales it is necessary to multiply the mental age variations for these two squares by 1½ in order to keep the variations uniform. This simple operation is done with the use of a table, however. Thus the — 2 under "Spelling," the + 5 under "Reading, Th-McC," the — 2 under "Reading," the — 2 under "History Information," and the + 1 under "History Thought" show that this boy was 2 scale points or one third of a year below his mental age norm in spelling, 5 scale points or nearly a year above in the Thorndike-McCall reading scale, 2 scale points or one third of a year below the norms in a history reading scale and in the information phase of American history, and 1 scale point above the norm in the thought phase of American history. These differences are found by subtracting from the 54½, 58, 70, 78 and 81 the scores opposite the mental age of 13-6 on the norm sheet; namely, the 56, 54½, 72, 80 and 80. The differences of — 1½ in spelling and + 3½ in reading become — 2 and + 5 respectively when multiplied by 1.5. The back of the norm sheet is used for the bottom half of the card in the same way as the front is used for the top half, the sheet merely being folded back on the same line for the mental-age norms in geography and arithmetic.

The fourth row of little squares provides spaces for recording the grade variations, the amounts by which the pupil's scores differ from the norms for the grade at the time the tests are given. For this process, the same norms are taken for all the

PLATE 63a

Mental Age Norms for Individual Record Card B—Top Half

Grade (End of Year)	Mental Age Yr.-Mo.	Spelling	Reading	History Reading	History Information	History Thought
	15-0	62	60⅔	81	89	89
	14-11	61⅔	60⅓	80½	88½	88½
	14-10	61⅓	60	80	88	88
	14-9	61	59⅔	79½	87½	87½
	14-8	60⅔	59⅓	79	87	87
	14-7	60⅓	59	78½	86½	86½
Grade 8	14-6	60	58⅔	78	86	86
	14-5	59⅔	58⅓	77½	85½	85½
	14-4	59⅓	58	77	85	85
	14-3	59	57⅔	76½	84½	84½
	14-2	58⅔	57⅓	76	84	84
	14-1	58⅓	57	75½	83½	83½
	14-0	58	56½	75	83	83
	13-11	57⅔	56	74½	82½	82½
	13-10	57⅓	55⅔	74	82	82
	13-9	57	55⅓	73½	81½	81½
	13-8	56⅔	55	73	81	81
	13-7	56⅓	54⅔	72½	80½	80½
Grade 7	13-6	56	54⅓	72	80	80
	13-5	55⅔	54	71½	79½	79½
	13-4	55⅓	53⅔	71	79	79
	13-3	55	53⅓	70½	78½	78½
	13-2	54⅔	53	70	78	78
	13-	54⅓	52⅔	69½	77½	77½
	13-0	54	52⅓	69	77	77
	12-11	53⅔	52	68½	76½	76½
	12-10	53⅓	51⅔	68	76	76
	12-9	53	51⅓	67½	75½	75½
	12-8	52⅔	51	67	75	75
	12-7	52⅓	50½	66½	74½	74½
Grade 6	12-6	52	50	66	74	74
	12-5	51⅔	49⅔	65½	73½	73½
	12-4	51⅓	49⅓	65	73	73
	12-3	51	49	64½	72½	72½
	12-2	50⅔	48⅔	64	72	72
	12-1	50⅓	48⅓	63½	71½	71½
	12-0	50	48	63	71	71
	11-11	49⅔	47⅔	62½	70½	70½
	11-10	49⅓	47⅓	62	70	70
	11-9	49	47	61½	69½	69½
	11-8	48⅔	46⅔	61	69	69
	11-7	48⅓	46⅓	60½	68½	68½
Grade 5	11-6	48	46	60	68	68
	11-5	47⅔	45⅔	59½	67½	67½
	11-4	47⅓	45⅓	59	67	67
	11-3	47	45	58½	66½	66½
	11-2	46⅔	44½	58	66	66
	11-1	46⅓	44	57½	65½	65½
	11-0	46	43⅔	57	65	65
	10-11	45⅔	43⅓	56½	64½	64½
	10-10	45⅓	43	56	64	64
	10-9	45	42⅔	55½	63½	63½
	10-8	44⅔	42⅓	55	63	63
	10-7	44⅓	42	54½	62½	62½
	10-6	44	41⅔	54	62	62
	10-5	43⅔	41⅓	53½	61½	61½
	10-4	43⅓	41	53	61	61

PLATE 63 b

Mental Age Norm for Individual Record Card B—Bottom Half

Grade (End of Year)	Mental Age Yr.-Mo.	Geography		Arithmetic			Handwriting		
		Information	Thought	Fundamentals		Problems	Quality	Rate	
	15-0	89	89	89	89	81	66	12.3	83
	14-11	88½	88½	88½	88½	80½			
	14-10	88	88	88	88	80		12.2	82
	14-9	87½	87½	87½	87½	79½	65		
	14-8	87	87	87	87	79		12.1	81½
	14-7	86½	86½	86½	86½	78½			
Grade 8	14-6	86	86	86	86	78	64	12.0	81
	14-5	85½	85½	85½	85½	77½			
	14-4	85	85	85	85	77		11.9	80½
	14-3	84½	84½	84½	84½	76½	63		
	14-2	84	84	84	84	76		11.8	80
	14-1	83½	83½	83½	83½	75½			
	14-0	83	83	83	83	76	62	11.7	79½
	13-11	82½	82½	82½	82½	74½			
	13-10	82	82	82	82	74		11.6	79
	13-9	81½	81½	81½	81½	73½	61		
	13-8	81	81	81	81	73		11.5	78½
	13-7	80½	80½	80½	80½	72½			
Grade 7	13-6	80	80	80	80	72	60	11.4	78
	13-5	79½	79½	79½	79½	71½			
	13-4	79	79	79	79	71		11.3	77½
	13-3	78½	78½	78½	78½	70½	59		
	13-2	78	78	78	78	70		11.2	77
	13-1	77½	77½	77½	77½	69½			
	13-0	77	77	77	77	69	58	11.1	76
	12-11	76½	76½	76½	76½	68½			
	12-10	76	76	76	76	68		11.0	75
	12-9	75½	75½	75½	75½	67½	57		
	12-8	75	75	75	75	67		10.9	74
	12-7	74½	74½	74½	74½	66½			
Grade 6	12-6	74	74	74	74	66	56	10.8	73
	12-5	73½	73½	73½	73½	65½			
	12-4	73	73	73	73	65		10.7	72
	12-3	72½	72½	72½	72½	64½	55		
	12-2	72	72	72	72	64		10.6	71
	12-1	71½	71½	71½	71½	63½			
	12-0	71	71	71	71	63	54	10.5	70
	11-11	70½	70½	70½	70½	62½			
	11-10	70	70	70	70	62		10.4	69
	11-9	69½	69½	69½	69½	61½	53		
	11-8	69	69	69	69	61		10.3	67½
	11-7	68½	68½	68½	68½	60½			
Grade 5	11-6	68	68	68	68	60	52	10.2	66
	11-5	67½	67½	67½	67½	59½			
	11-4	67	67	67	67	59		10.1	64½
	11-3	66½	66½	66½	66½	58½	51		
	11-2	66	66	66	66	58		10.0	63
	11-1	65½	65½	65½	65½	57½			
	11-0	65	65	65	65	57	50	9.9	61½
	10-11	64½	64½	64½	64½	56½			
	10-10	64	64	64	64	56		9.8	60
	10-9	63½	63½	63½	63½	55½	49		
	10-8	63	63	63	63	55		9.7	58½
	10-7	62½	62½	62½	62½	54½			
	10-6	62	62	62	62	54	48	9.6	57
	10-5	61½	61½	61½	61½	53½			
	10-4	61	61	61	61	53		9.5	55½
	10-3	60½	60½	60½	60½	52½	47		

pupils of the class. As the class to which this boy belonged took the tests at the middle of the seventh grade, the norms for the corresponding mental age of 13 years 0 months were taken as the basis of comparison. From the scores of 54½, 58, 70, 78 and 81, the norms of 54, 52½, 69, 77, and 77 were subtracted, giving grade variations of + ½, + 8 (when multiplied by 1.5), + 1, + 1 and + 4. These indicate that the pupil was above grade in all these tests, in the Thorndike-McCall Reading Scale by a year and a third even.

The Mental-Age and Grade Norms Are Based on Current Practices. One of the complex problems in working out a usable technique of organizing the data of an achievement survey was the determination of the mental age and grade norms for the scales selected for use. For this purpose both the Terman Group Test of Mental Ability, Examination A, and the National Test of Intelligence, Scales A and B of Form 1, together with one educational scale in each phase of elementary school work, were given near the close of a semester's work to 1200 girls and boys in different schools in different cities, with approximately 100 boys and 100 girls in each half of the sixth, seventh, and eighth grades. From these data the median scale score was found for each mental age. With the mental age norms available for the middle range of mental ages, the regression equation was worked out for each scale. On the basis of these equations the norms were extended in each direction, and then carefully checked up with available grade norms as well as with the scores made by a class of gifted pupils working under very favorable instructional conditions. The results of this procedure have been embodied in a Sheet of Norms, a portion of which is given on Plate 63. These norms will not always correspond with those given in connection with the scales nor found in connection with their use. These are based on mental ages as determined by the use of the Terman Group Test of Mental Ability. The grade norms have been selected to correspond with what has seemed to be the most probable mental age to be expected at the end of each grade. The grade norms also imply a somewhat even emphasis upon the various phases of school work from grade to grade above the fifth grade. Likewise a gain of six points from grade to grade in each subject implies a relatively even emphasis from one phase of school work to another. While these conditions tend to happen only occasionally in any one class, they do fairly well express what happens when the gains for any phase of school work are averaged for many classes or when the average gains in all phases of school work are averaged for many classes. In fact, the average gain in any class of normal pupils working with an average amount of effort under the usual conditions of instruction has been found to vary in either direction from the 6 points by only a slight amount. Whatever inaccuracy is involved in accepting a gain of 6 points as normal is more than offset by its simplicity and convenience. Eventually, of course, more accurate norms may be determined under experimental conditions but until that is done the present norms will fulfill a very useful purpose.

There Are Different Ways of Measuring a Pupil's Quality of Work. One method is to compare the gains made with the normal amount of gain to be expected. In using the yearly gains as measures of quality of work, it should be kept in mind that 6 points is the gain to be expected of an average pupil, a pupil with an intelligence quotient of 100. A pupil with an intelligence quotient of 83 has a normal rate of achievement only about five-sixths as great as a pupil with an intelligence quotient of 100, hence we should expect him to make a gain of only 5 points as compared with a gain of 6 points for the average pupil. Again, a pupil doing an average quality of work should make a gain of 4½ points if he has an intelligence quotient of only 75, but a pupil with an intelligence quotient of 117 should be expected to gain 7 points, one with an intelligence quotient of 125 seven and a half points, and one with an intelligence quotient of 133 eight points or just twice as great a gain as the pupil with an intelligence quotient of 67.

To express a pupil's quality of work in terms of the approximate per cent that he should be expected to achieve in any subject with effort and instruction of an average quality, the achievement quotient obtained by dividing the pupil's educational age in a subject by his mental age, is an extremely useful measure. This, however, is not directly a measure of the quality of work of the previous year or grade but that of the previous year when averaged in with all other previous years. Any improvement in the achievement quotient from year to year does, however, indicate an improvement in the quality of work since the time when the earlier achievement quotient was determined for the pupil. It should be kept in mind that many conditions besides a poor quality of work on the part of the pupil may be responsible for a low achievement quotient in several phases of school work. Late entrance into school, a great deal of absence, poor instruction, lack of the usual amount of emphasis upon the subject; these may all contribute toward its deficiency. Nevertheless it is an important device for isolating the responsible conditions, as well as for making the low quality apparent in a definite, quantitative way. The achievement quotients may be found in several ways; the educational ages of the pupil may be divided by his mental age or his educational quotients may be divided by his intelligence quotient, or they may be found with the use of a chart directly from the pupil's achievement scores and mental age.

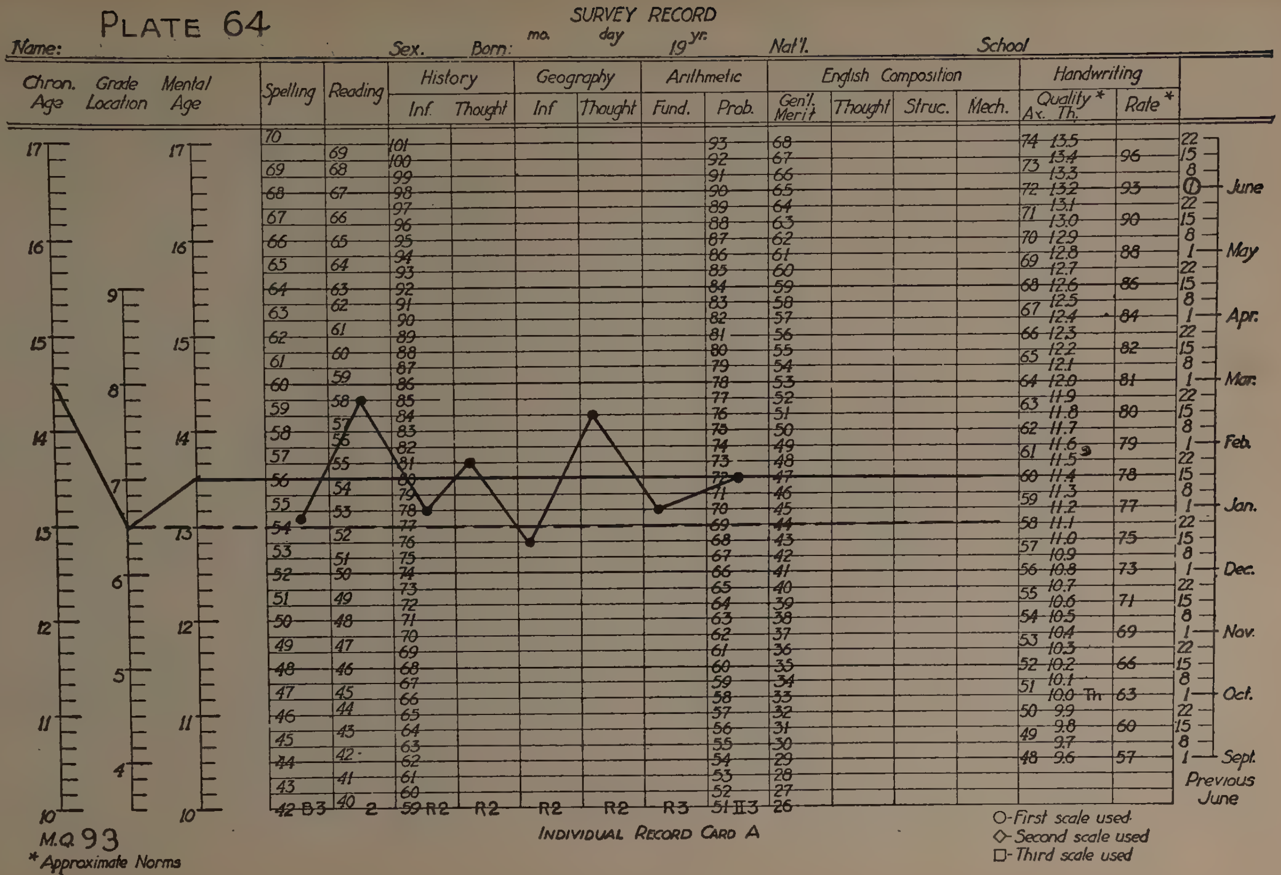
For the scales making up this series the educational ages of a pupil may be read off directly from the sheet of norms, from the Age and Quotient Chart or from the teacher's individual record card, which is described later. On the Norm Sheet simply trace up the column of scores in the desired subject until the pupil's score is found. On the same line at the left edge will be found his educational age in that phase of instruction. This is sometimes a useful measure in considering a pupil's promotion but is not essential for the determination of any other measure.

Several Devices Are Available for Finding Intelligence and Achievement Quotients. Among those that have come into use for finding intelligence quotients are modifications of the slide rule, charts, such as the Coxe Quotient Chart, and tables such as the Inglis Table. By transforming the educational scale scores into educational ages the same devices may be used for finding the achievement quotients. The author's Age and Quotient Chart is a still more convenient device, making it possible to determine the achievement quotients directly from the scale scores and the mental age of a pupil. The same instrument may also be used to find the intelligence quotient directly from the group mental test score and the chronological age of the pupil. The educational ages of a pupil may also be read off from his scores. With the use of this same chart the mental age of a pupil may be readily derived from his intelligence quotient and his chronological age. Thus in re-surveys only the achievement scales need to be given.

For Presenting Graphically the Data Entered on the Permanent Individual Record a Smaller Record Card Has Been Devised for the Teacher's Use. Instead of the pupil's scores being entered on these cards they are merely indicated by circles placed after the numbers corresponding to them. The pupil's chronological and mental age and his grade location are indicated in a similar manner. Thus on Plate 64 the line drawn from the point three spaces above the 14 on the first vertical line at the left to the point three spaces above the 6 or half way between the 6 and 7 on the middle vertical line, and then to the point three spaces above the 13 on the third vertical line indicates that the pupil whose record is given on this card was 14 years 6 months old chronologically, half way through the *seventh grade,* and had a mental age of 13 years 6 months at the time the measurements were made. His intelligence quotient of 93 is entered in the lower left hand corner. His score of 54½ in spelling is indicated by the circle just above the 54 in the column under spelling, his reading score of 58 by the circle after the 58 in the column under reading, and his scores in American history, geography and the fundamental operations of arithmetic by the circles after the 78, 81, 76, 84, and 78 in the column under history information but in their appropriate columns. Likewise his score of 72 in arithmetic problems is indicated by the circle after the 72 in the column under arithmetic problems.

To make them stand out more clearly these little circles may be connected by straight lines as in the illustration. By drawing a line from the pupil's chronological age location to his grade location and from there to his mental-age location on the vertical lines at the left of the card one obtains a graphic representation of the relationships of these three factors. Then, by drawing a continuous heavy horizontal line across the card at his mental age and a broken horizontal line at his grade level, the relations of these factors to his actual achievement may also be expressed graphically. The distances that the circles are above or below the continuous horizontal line correspond to the mental age

PLATE 64



INDIVIDUAL RECORD CARD A

variations in the third row of little squares on the permanent individual record card, while the distances above or below the broken horizontal line correspond to the grade variations in the fourth row of squares on the permanent record card (Plate 62). Each space on the teacher's graphic card (Plate 64) is equivalent to one scale point or two months' gain.

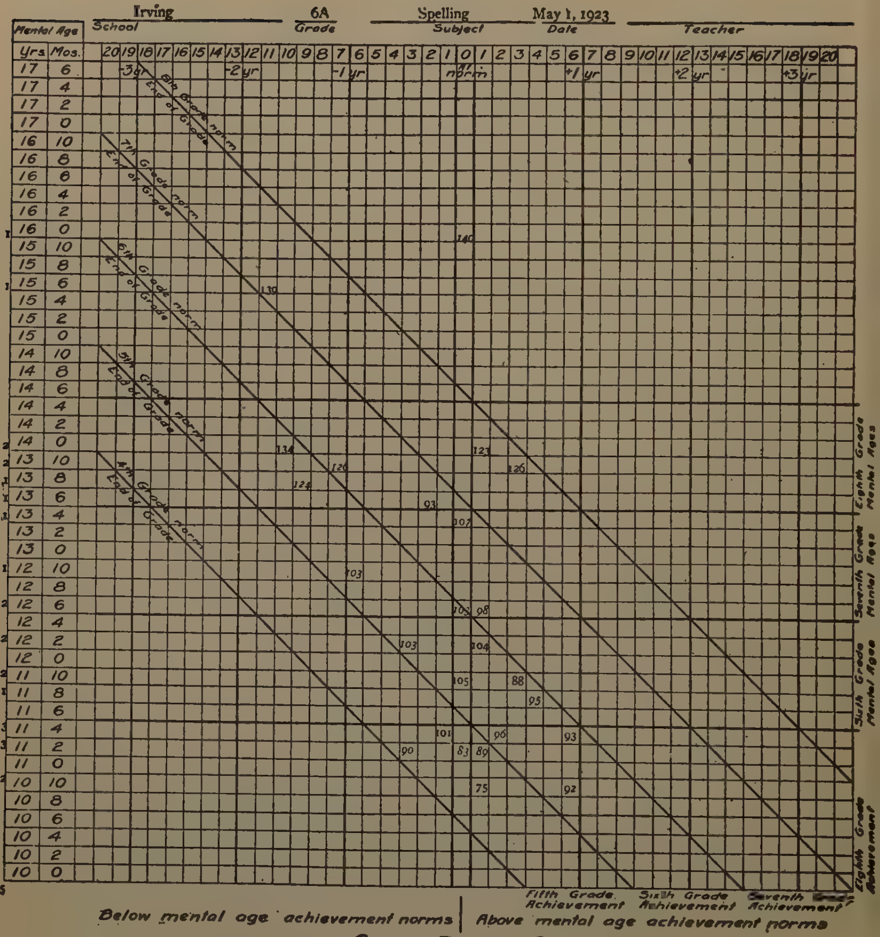
In case a pupil has a normal chronological and mental age for his grade location the line would be a continuous horizontal one across the three vertical lines and the continuous and broken lines across the rest of the card would coincide. Both the date at which the test is given and the scale used may also be indicated on the card by placing the letter and division number of the scale within the same column as the circle and on the line running through the date at the right edge. Thus, spelling scale B, division 3 was given the previous June. In handwriting the pupil made a score of 61 on the Thorndike Handwriting Scale during the week beginning October the first. When the whole series is given within a brief period the middle date for the group may be indicated by a circle around the date. The circle around the first of June shows that the entire series of tests except the one in handwriting was given during the week of June the first.

These cards have still a further use. On locating the scale score by a circle the horizontal line on which it falls may be traced to the vertical lines at the left. Where it would cross the mental-age vertical line if extended indicates the pupil's educational age in that phase of school work. By extending this line still farther to the left until it would cross the Grade Location vertical line, the pupil's grade attainment in that phase of school work may likewise be seen. Thus on Plate 64, the pupil has a reading age of 14 years 4 months and a grade attainment that is within two months of the eighth-grade norm at the end of the grade. The digits on the grade location vertical line indicate the end of the grade, not the beginning, just as 14 on the first vertical line indicates that the pupil has passed his 14th birthday. As each space is equivalent to two months' gain it is also evident that the pupil is ten months in advance of his mental-age norm and sixteen months in advance of his grade norm in reading.

With Very Little Work the Data on the Permanent Individual Record Cards May Be Transferred to a Comprehensive Class Card. The results of an achievement survey are usually expressed in terms of group measures of achievement such as median scores and measures of variability. Several of the more recent surveys have recognized the inadequacy of measures of achievement alone and have included the median mental ages of the classes and in some instances the median intelligence quotients. Their inclusion has in some cases prevented some possibly gross misinterpretations of achievement medians. Such a procedure, however, gives no clue as to the relations of these elements to one another in the class. It fails to show whether the brighter or duller pupils are doing the better quality of work; that is, which are achieving the more in relation to their capacity to achieve. To present, in such a way that each pupil's record is identifiable, the mental ages of the pupils in a class, their intelligence quotients, their achievement status in a subject or in any combination of subjects, their variations from their mental-age norms, their variations from the grade norm and their quality of work, as well as the interrelations of all these features, the class record card given on Plate 65 has been devised.

In making out the class record cards only one entry needs to be made for each pupil. For any entry to be readily identifiable as belonging to a particular pupil makes it very much more valuable. As one of the most significant things about a pupil is his rate of gain in mental age, the intelligence quotient is obviously the most significant number by which a pupil may be identified. Hence this has been selected for use in making the entries on the class record cards. From the individual record card of a pupil several other significant items can be transferred to the class record card at the same time the intelligence quotient is entered. Of these, the mental ages are printed at the left edge of the card and the numbers of units that a pupil may vary from his mental-age norms are printed at the top. By entering the pupil's intelligence quotient at the place where the mental-age row crosses the column in which his mental-age variation is given at the top, all three items are recorded with the single entry. For example, the pupil whose record is given on Plates 62 and 64 has a mental age of 13 years 6 months, an intelligence

PLATE 65



Irving School 6A Grade Spelling Subject May 1, 1923 Date Teacher

CLASS RECORD CARD - B

quotient of 93, and a mental-age variation in spelling of — 2. On finding the 13 — 6 at the left side of the class record card on Plate 65 and the 2 on the left side of the double heavy vertical lines through the center, the 93 is written in the square where the row and column cross. All the minus numbers go in the left half of the card and the plus ones in the right half. In the same way the corresponding items for all the other pupils in the class should be entered.

There are, of course, other important items that should be entered on the class card: the amount by which the pupil's mental age differs from his grade norm, and the amount by which his score differs from his grade norm. Both of these have already been entered, however, as the heavy horizontal lines indicate the grade mental age norms and the oblique lines indicate the grade achievement norms for the end of the grade. By using red ink to write the intelligence quotients of the girls and black ink for boys' intelligence quotients still another important group of relationships may be made evident.

When a class record card has thus been filled in for any phase of school work it shows at a glance the number of pupils in the class who are at the several grade mental-age norms, as indicated by the heavy horizontal lines; how widely the mental ages of the pupils are scattered as well as what mental age is the central one for the class; what proportion of the boys and of the girls are living up to their general mental capacity in that phase of school work and how many of the pupils are at the different years below or above their general mental capacity, as indicated by the heavy vertical lines on either side of the "O" or "At norm" column; how many of the boys and of the girls are doing the expected work at their own grade standard and how many are attaining the achievement standards of each of the other grades, as indicated by the heavy oblique lines. Such other facts as the relation of the quality of work to the size of the mental ages or quotients and the achievement and quality of work of the girls as compared with that of the boys are also apparent. On the back of the record card are blank tables for making quantitative summaries of the facts presented on the front page in case these may be desired.

There Is Also a Frequent Need for Organizing the Achievements of All the Pupils of a Class, a Grade or Even of a School in All Phases of Instruction. While the class cards are adapted for organizing the different kinds of facts for a class or a whole grade in a school system, some further device is essential for giving a picture of the educational conditions in all phases of school work in all the grades of a school. The tables summarizing the results in mid achievement scores are convenient to work with but fail to show the interrelationships as clearly as is often desirable. As the original distributions from which the mid scores are derived seem best to serve this purpose, a distribution sheet has been devised for tabulating the mental ages, original scores and the quotients in such a way as to render intercomparisons simple. In this distribution sheet, of which Tables 1, 2 and 3 in the first chapter are modifications, spaces have been provided for recording the number of pupils of each mental age in each grade from the fifth through the eighth. By tabulating the numbers of pupils of each mental age in the appropriate column for the grade, the relation of the distribution of mental ages in that grade to the norms for each of the grades for the middle and end of the year's work is at once apparent, the short heavy lines indicating the tentative standards. On finding the mid-score for the class and indicating it by dotted lines the extent to which it is above or below the grade norm is also evident. Thus, there is apparent from a single tabulation, the amount of overlapping from grade to grade and the differences in mid mental ages from grade to grade. This distribution sheet is intended for use either near the middle or near the end of the work of the grade. At the same time it is adapted for use in schools having either yearly or half yearly promotions.

In the same way that the sheet is adapted for tabulating the mental ages, it is also adapted for tabulating the achievement scale scores in the various phases of elementary school instruction. Furthermore, it is so arranged that the norms in all phases of school work for any mental age, or for any grade at any time, are on the same line as the mental age itself. In each grade distribution column there is also a short heavy line indicating the grade norm for the end of that grade or half grade. When the class mental age varies from the one given on the Norm Sheet for that grade, as it will in many instances, one should expect the achievement mid scores to vary accordingly unless the quality of work or amount of emphasis is greater or less than is usual. On the back of the distribution sheet there are columns for a similar tabulation of the intelligence quotients and of the achievement quotients made in all the upper grades in a school.

The distribution sheet can be readily filled in for a class by arranging the permanent individual record cards in the order of the size of the mental ages and then writing after each mental age on the distribution sheet and in the appropriate grade column the number of pupils in the class having that mental age. In the same way the cards may be arranged in the order of the size of the spelling scores and the number of pupils making each spelling score written after that score under "Spelling" on the distribution sheet. When this has been completed the mid or class scores may be calculated by finding the mid-score in the column or where there is no mid-score, as in the case of an even number of scores, by taking the average of the two middle scores.

On this sheet, as on the Norm Sheet and on the Age and Quotient Chart, the norms represent average quality of work with the usual amount of emphasis upon the various phases of school work in so far as they have been ascertainable without resorting to the very costly experimental procedure that has not been feasible up to the present time.

How to Make and Use a Classification Sheet. For facilitating the plotting of the chronological and mental ages, intelligence quotients and achievement variations of all pupils upon a single chart for the purpose of reclassification, a classification sheet like the one suggested in Charts 1 to 5 will be found very useful as well as very simple to make. Use any large sheet with squares on it similar to those on Charts 1 to 5. Along the top and bottom indicate the mental ages. Down both the left and right edges indicate the chronological ages. In making the entries on Charts 1 to 5 these directions were followed.

1. Note the pupil's chronological age at the left side of the individual record card B. Find it at the left edge of the classification sheet. Then note the pupil's mental age in the large square at the left side of the individual record card. If two mental ages are given—one in the first square headed "Intelligence" and a second in the next square to the right, also headed "Intelligence," use the average of the two mental ages, dropping the fraction. Find the mental age along the top of the classification sheet. Follow down this vertical column until it crosses the horizontal column containing the pupil's chronological age at the extreme left edge or extreme right edge.

2. At the top of the square where the two columns cross write the pupil's intelligence quotient. If more than one is given use the average intelligence quotient. In the lower part of the little

square write the average grade variation. For this purpose the algebraic average should be taken of all the variations considered pertinent.

3. When the work of pupils in several grades is to be plotted on the same classification chart the same variations should be used for all the grades. Also the variations should be reduced to the same base. To reduce them all to the sixth-grade norm for the end of the grade, for instance, 6 should be subtracted from the average grade variation of all high fifth-grade pupils, and 3 from the average variation of all low sixth-grade pupils. At the same time, 3 should be added to the average variation of all low seventh-grade pupils, 6 to that of all high seventh-grade pupils, 9 to that of all low eighth-grade pupils, and 12 to that of all high eighth-grade pupils. Low, of course, refers to the first half year in the grade and high to the last half year of the grade.

4. The heavy oblique line down through the sheet should be drawn in the same direction as on the plate. It gives a close approximation to the amount of gain in mental age that one may expect during a year so that in making a new classification the groupings may be made on the basis of the mental ages that the pupils will be at the end of the grade rather than on the basis of the mental ages that they will be at the beginning of their work. In this way the intelligence quotients are automatically brought into the classification. The direction of the line is based upon the distribution of intelligence quotients that may be normally expected. This oblique line may be moved toward the right or left for convenience, so long as the direction is not changed.

After the cases have all been tabulated lines may be drawn to mark off the classes as has been done in Charts 2 and 4. As the determination of these lines of separation will depend in all cases upon the local distribution of cases, no definite rules can be laid down. In a reclassification the important element will be the good judgment of the person working it out. Such data as the classification sheet provides for will be found of great value, however, even though the procedure cannot be carried through as mechanically as the tabulations can be made.

How Completely the Data Should Be Organized for Any School or School System Depends Upon the Purpose of the Survey. The complete set of cards and accessories[1] consists of

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[1] Published by the Public School Publishing Company, Bloomington, Illinois.

1. The permanent individual record card B for the school files.
2. The teacher's individual record card A for a graphic presentation of the data for an individual.
3. The class record card B for organizing the achievement and quality of work of a class or grade.
4. The summary sheet for organizing the achievement of the upper grades of the entire school or school system.
5. A Norm Sheet, which accompanies each book of directions, for finding the mental age and grade variations.
6. An Age and Quotient Chart for finding the intelligence and achievement quotients, the mental and educational ages from the test and scale scores, and the mental ages from the intelligence quotient and chronological age.

For the use of the school the permanent individual record card B is the most satisfactory as the data from four successive measurements may be entered on the same card. From these entries gains in achievement may be easily calculated. The data on these cards are also the basis of making out the class record cards. From the data on them the teacher's individual card A can also be readily filled out either by the teacher or by an assistant. For the teacher this smaller card with the graphic presentation of the data is easier of comprehension and interpretation. The class card B, one of which is needed for each phase of instruction measured, is valuable to a teacher at the end of a semester to see what has been happening in her class. A similar set of cards made out for the new classes at the beginning of each year will give the teacher a clear idea of the composition of her class, what groups of pupils are most in need of special attention, and what phases of instruction are most in need of emphasis. The summary sheet saves a great deal of time in making out the distributions of scores and determining the class scores as well as furnishing a clear picture of the interrelations of the class scores. For deriving the achievement quotients the Age and Quotient Chart is almost indispensable. Not all these cards need to be used in any situation any more than the entire series of tests needs to be given, nor do all the derived items need to be entered on the permanent individual record cards. The extent of the measurement program and of the organization of the data should be determined on the basis of its value in any local situation. With the mid scores that are now available (September, 1926) from the sixth grade achievement survey in San Francisco, California, and from the several sixth- and eighth-grade achievement surveys in St. Paul, Minnesota, as well as from the sixth- and eighth-grade achievement surveys in eighteen of the smaller cities and towns in the states of Minnesota, Washington, and West Virginia, significant comparisons can be made for practically any type of school system.

Reliability of the Scores and Derived Measures Used in an Achievement Survey. Quite as important a feature of a survey of school achievement as any of those that have so far been discussed is the reliability of the measurements made in connection with it. Most of the educational scales now have the probable errors of the measures stated in the descriptive pamphlets. In order to obtain the probable errors of the various derived measures used in connection with the surveys a double series of mental tests and educational scales were given to the eighth-grade pupils applying for admission to the University High School. The tests and scales were given on three consecutive Saturday mornings. The schedule was so arranged that the duplicate test and scales were given one week later than the first one in the pair, and also by a different individual. Each of two series of tests and scales was also scored by different individuals. In this way the two series of measures were absolutely independent of one another except that they were measures of the same abilities and of the same pupils. Of the total number of applicants, 48 had complete records. While this number is rather small, the fact that there was but little variation in the probable errors of the derived measures for each of the tests and scales indicates that they possess a fair degree of reliability. The probable errors of the various measures determined on the basis of the results from these 48 cases are summarized in Table 27. For the Thorndike-McCall Reading Scales and the Buckingham Scales for Arithmetic Problems the probable errors of the derived measures were somewhat larger than those given in the table, owing to the fact that with this group the probable errors of the scale scores came out somewhat higher than in the case of the other scales. The number of cases, however, was too small a one on which to determine the probable errors of the individual scores in these two scales. A larger number of cases will undoubtedly indicate that the probable errors of individual scores in these scales are also small.

TABLE 28.

PROBABLE ERRORS OF THE SEVERAL MEASURES WHEN ONLY ONE TERMAN GROUP MENTAL TEST AND ONE SERIES OF ACHIEVEMENT SCALES ARE USED.

P. E. of the mental age ± 4 months.
P. E. of the intelligence quotient ± 2 points.
P. E. of the mental age variations ± 3 deciquartiles or scale points.
P. E. of the grade variations ± 2 deciquartiles or scale points.
P. E. of the achievement quotients ± 3 points.
P. E. of the average of the mental age variations ± 3 deciquartiles.
P. E. of the average of the grade variations ± 2 deciquartiles.
P. E. of the average of the achievement quotients ± 3 points.

PROBABLE ERRORS FOR THE SEVERAL MEASURES WHEN TWO TERMAN GROUP MENTAL TESTS AND TWO SERIES OF ACHIEVEMENT SCALES ARE USED.

P. E. of the mental age ± 3 months.
P. E. of the intelligence quotient ± 1.5.
P. E. of the mental age variations ± 2 deciquartiles.
P. E. of the grade variations ± 1.5 deciquartiles.
P. E. of the achievement quotients ± 2 points.
P. E. of the average of the mental age variations ± 2 deciquartiles.
P. E. of the average of the grade variations ± 1.5 deciquartiles.
P. E. of the average of the mental quotients ± 2 points.

What the Probable Error of a Score Means. What is meant by this term and what it indicates may best be illustrated from a common, everyday occurrence. It has been found by rechecks in over 9000 sales of textiles in 210 stores that the average error in measurement is 3¾ per cent. This means that in measuring a yard of cloth a clerk is likely to make an average error of one and a third inches or a median error of 1.14 inches. In buying yards of cloth, then, one should expect to come home half of the time with pieces that are either 37.14 inches or over or else 34.86 inches or less. Thus one's chances are even of bringing home yards of cloth which are either too long or too short by 1.14 inches. Likewise, one's chances are even of bringing home yards of cloth that do not vary from 36 inches by more than 1.14 inches. Such a measure of error is called the probable error of the measurement. In the educational scales made up of thirty tasks each; and with the deci-quartile, or one tenth of the semi-interquartile range, as the unit of measurement, the probable error is just about two scale points or two deci-quartiles out of a probable total range of ability of approximately 160 scale points or deci-quartiles. In the A, B, C, D and E spelling scales, which are made up of 40 words each, the probable error is about one and a half spelling scale score points or slightly above two deci-quartiles. Although the probable error of the measurements is nowhere stated for either the Thorndike-McCall reading scales or the Morrison-McCall spelling scales, it is also probably about 2 deci-quartiles, with very little likelihood of its being above or even as high as two spelling-scale or reading-scale points. In the case of the quality scales for measuring handwriting, English composition and drawing, the probable error of the pupil's score will depend upon the number and skill of the judges using the scale. Occasionally a person is found, who with a very little training, can rate compositions with a probable error of less than four deci-quartiles. The term probable error as used here refers to the extent to which the ability measured by the scale differs from the scale score. What the significance of a probable error of two deci-quartiles or two scale points in one of the American history scales is for a group of 60 pupils may be made clear by indicating the number of pupils whose abilities would vary from their scores by different amounts. Since the scale scores have a probable error of two scale points 8 of the 60 pupils would make scores that would coincide with their abilities or not differ from them by more than half a scale point, 15 would make scores that would differ from their abilities by one scale point,[1] 13 would make scores differing from their abilities by two scale points, 10 would make scores differing by three scale points, 6 would make scores differing by four scale points, 4 would make scale scores differing by five scale points, and 4 would make scores differing by six or more scale points.

To obtain a probable error of only one deci-quartile in the case of these scales, four of them would need to be used and the average of the four scores taken as the pupil's score. As the scales yield approximately identical scores, and all in any series are in terms of the same unit of measurement, averaging can be done. In this case the abilities of 16 would coincide with their scale scores or not differ by more than half a scale point, 25 would make scores differing by only one[1] point, 13 would make scores differing by two scale points, 4 would make scores differing by three scale points, and only 2 would make a score differing by four or more scale points. While these amounts of probable error in a score may seem large one must still keep in mind that they are even smaller than the probable errors of measurements made in dealing with many physical quantities and far smaller than the probable errors of the subjective measurements and school marks in common use in education.

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[1] One scale point means in this connection from ½ a scale point to 1½ scale points, two scale points means from 1½ scale points to 2½ scale points, and so on.

CHAPTER XVIII

THE FUNCTIONS OF MEASUREMENT IN EDUCATION

So rapidly has the mental and educational measurement movement swept through our schools and so completely have many educationalists become engrossed in its practical applications that its functions are frequently in danger of becoming confused and misinterpreted. Failure to consider the variety and nature of its functions has unquestionably led to some undesirable effects upon the educational process and also to some gross misconceptions regarding its nature and functions. In its broadest implications the measurement movement may be said to have three main functions: a selective function, a diagnostic function and an evaluative function. Most of its undesirable effects as well as most of the misinterpretations of it have developed out of a confusion of these functions and out of an unfortunate tendency to make the instruments designed specifically for one of these functions serve in the other functions.

The Measurement Movement in Education Had Its Rise Primarily Because of Its Selective Capacity. By no means is it a recent movement. It arose when the earliest profession or guild set up standards of qualification for admission to its ranks. When such qualifications began to imply the possession of some particular information or skill the measurement movement in education had already begun. It at once implied some amount of some quality, even though the specific quality may have been very indefinite and the essential amount very vague and intangible. As soon as any means for estimating the amount of some tangible quality was hit upon, however superficial and fallible that means may have been, our present examination system had its inception. In part it was a means of exclusion from the select group, in part it was a means of maintaining the public confidence in the select group and in part it was also a means of protecting the social group as a whole. For a long while the means were undoubtedly confined to human judgments of fitness. Nor have we entirely outgrown them today, despite their crudities, their biases, and their uncertainties. The work of an artist is still evaluated in this way. The same picture may be considered meritorious by one group of judges and decidedly lacking in merit by another group.

In time the professional examination took on the nature of a public defense of a thesis, the quality of which was evaluated by members of the profession. On the basis of their judgments the candidate's fitness to enter the profession was decided. Nor was the procedure markedly different in the case of the early guilds. The candidate's skill had to be demonstrated to the satisfaction of the guild members. Much the same process is resorted to today. A new instrument—the written examination—has been more recently introduced as an additional means of determining the extent of a candidate's qualifications. This written examination became primarily a means of measuring a candidate's range of information with reference to the tasks that he might be called upon to perform. Both the college entrance examinations and the Civil Service examinations are illustrations of this tendency. In selecting certain individuals for a particular function they have also excluded from that trade or profession other individuals less proficient in the informational qualifications. These examinations have undoubtedly given the public a greater degree of confidence in the competency of the members of that trade or profession and have also given the public a marked degree of protection from the bunglings of the incompetent and the untrained who might otherwise attempt the tasks which are becoming more and more confined to those of special training and accepted competency. But in failing to distinguish between lack of capacity and lack of training the confusion of the selective and evaluative functions of educational measurements is at once apparent.

The Effect upon Educational Practice of Confusing These Two Functions Has Not Been a Happy One. The gradual evolution of more adequate standards of fitness for admittance into any craft or profession has been accompanied by the development of more definite and specific examinations. In a large measure the examinations are an expression of the standards of competency. In so far as the examinations are representative of the requirements of a vocation they may serve their purpose. Yet to the candidate they may be merely hurdles to be cleared. When the passing of examinations become the end in view, they are likely to have a formalizing and deadening effect upon the educative process. This tendency, however, has largely grown out of the attempt to make the same instrument perform two distinctly different functions: one a selective one—the discernment of whether or not the individual has the capacity to succeed in the vocation; the other an evaluative one—the determination of whether or not the individual has acquired the necessary range of information to be entrusted to practice the vocation in which he may have the capacity to succeed. From the evaluative or measurement of achievement point of view the examination is not a hurdle to be cleared at the earliest possible moment and by any means; rather the point reached in it would indicate to the student how wide a range of information he has already attained in relation to what he needs to acquire in order to enter his vocation with the assurance of succeeding in it. It is quite as much to the interest of the student to realize that his preparation is inadequate and to what extent it is inadequate as it is to the interest of the public in general. Such an attitude toward the examination implies a form of content examination that gives definite, significant and meaningful scores. It also shifts the emphasis in the educational procedure from a mere preparation for the passing of examinations to the gaining of the necessary broad range of information that is demanded for a successful practice of the vocation. While this attitude may seem idealistic one must keep in mind that even attitudes towards examinations, whatever they may be, are acquired tendencies.

The unwholesome attitude of considering examinations as goals to be passed instead of instruments of measurement is not confined to vocational or professional education. One need only to turn to the non-vocational content courses in the elementary, secondary or college curricula to see its influences in full force. Just as in the older Chinese system of education so in our own schools, the passing of the examinations is one of the conditions for attaining the next higher level in the school system; the next grade in the elementary school, and the next consecutive course in the high school and college. It is likewise the basis of admission to high school and college. Were the passing of a content examination synonymous with the possession of a certain range of information in certain fields of knowledge or the possession of certain amounts of certain skills, there might be greater justification for its effects upon the educational procedure in the elementary school and high school even though its fundamental function in this respect is a selective one rather than an educational one.

A single illustration may be cited to show the selective functioning of content examinations in non-vocational courses. Except in New York City, graduation from high school in New York State is dependent upon the passing of a series of examinations sent out under the authorization of the Board of Regents. As examinations, they are probably made up with greater care than are most examinations. That they should to some extent possess all the characteristic defects of examinations made out in the usual way is to be expected. Some of the tests are harder than others, some cover the subject better than others, in all the scoring largely depends upon the subjective standards of the teachers. Their effect upon the process of teaching is what we are immediately concerned with, however. Do the teachers consider them as adequate measures of the pupils' abilities and ranges of information? If so the teachers would give little or no thought to preparing the pupils primarily to pass them. They would be concerned with having the pupils build up wider and wider ranges of information in their respective fields or else with having the pupils acquire skills of greater effectiveness. Yet by students and teachers alike these examinations are considered as hurdles to be cleared with the nearest possible leap, followed by the feeling, "Thank Heavens, that is over." The fact that earlier test papers are used during the last few weeks in some classes for purposes of study and review is sufficient evidence that the students are challenged by these hurdles and the prospective marks that they embody rather than by any keen desire to know.

Undesirable as this attitude may be from an educational point of view, the usual high school examination does not result in an attitude toward the work of the classroom that is essentially different. Otherwise we should not need to bear with discussions of the effects of "cramming." These, too, are largely selective in function. The colleges, when they do not set up selective content examinations of their own depend upon examinations such as the New York State Regents' examinations or else upon the results of high school examinations as expressed in school marks or graduation. Nor is the situation radically different in the elementary or junior high school. Here the pupils are somewhat less conscious of the examinations as an end, perhaps, but they are looked upon as an ordeal to be undergone.

The Selective Function Is Best Fulfilled by the Mental Test. Happily, the last few years have witnessed the development of an entirely new instrument for performing the selective process —the mental examination. However crude the general mental examination may be in its present state, however unanalytical and unreliable may be its scores, however unwarranted may have been some of the claims made for it and some of the uses to which it has been put, and however misleading and uncritical may have been the interpretation of some of the results arrived at through its use, its legitimate use is replete with future possibilities. On the basis of the mental examination, when it becomes reasonably well developed and made sufficiently reliable in its readings, we may expect that fitness for different types of vocations may be predicted reasonably early in a child's school career instead of after a considerable amount of time has been spent in vocational preparation. At the present time we are too apt to think of the mental examination as an instrument that may be used to exclude people from doing the things they may want to do. It needs to be kept in mind that the mental examination neither develops nor creates capacities for achievement; it merely indicates the amounts of their existence. In this respect it is like the physician's clinical thermometer, which neither relieves nor creates a fever in a patient. However, just as there are some people who abhor a physical examination for fear they may be found to have some physical deficiencies so there are people who seem disposed to take the same attitude toward the mental examination. But just as in the physical realm the early discovery of abnormalities may lead to the proper care that prevents their aggravation, so the early discovery of mental deficiencies may lead to the abandonment of attempting the achievement of the impossible and the centering of the individual's attention and effort upon ends that are attainable by him.

As an illustration of a specific mental test as contrasted with a test of general mental ability one may turn to the Seashore Tests of Musical Talent. An early discovery that a boy or girl has only a small amount of some of the traits that have been found essential for successful achievement in the field of music will not only result in a saving of the pupil's time, his parents' savings, and his music teacher's endurance and self-respect, but it is likely to save the child many a wearisome hour that might better be spent in wholesome play or some other field of endeavor in which some capacity for productive achievement is possessed by the child. Only a small part of the time spent in trying to make of the child a hopelessly ineffective producer of music might well result, if rightly used, in actually developing in him an appreciation for and enjoyment of music. In no sense would the findings of the musical tests handicap the child; only his lack of the necessary capacities as revealed by the tests would be responsible for that.

But there is a positive function for the mental test to perform which is far more important than the preventative function. The Seashore Tests of Musical Talent are quite as much designed for the discovery of musical talent as for the discovery of the lack of it. Oftentimes unusual talent is found in unexpected circumstances and under conditions where its chances for development would ordinarily be slight indeed. What is true in the case of musical talent is equally true in the case of any other mental capacity. Where unusual mental gifts of any kind can be brought to light and opportunities afforded for their development, not only is the individual greatly benefited thereby but also the social group as a whole. From this point of view the mental examination, in so far as it is adequately developed, has a far-reaching and socially valuable function to perform. At the same time it relieves the content examination of its misuse and of its deleterious effects upon the educational procedure in vocational and professional training.

The Diagnostic Function of the Measurement Movement Is Quite as Important as the Selective Function. Although little mention has been made in this volume of tests specifically designed to perform diagnostic functions, owing to the fact that a much larger work than the present one is needed to deal at all adequately with these tests alone, their importance should be clearly recognized. This can best be accomplished by calling attention to a few of the many outstanding diagnostic tests. In arithmetic the Wisconsin Inventory tests,[1] devised by Dr. Worth J. Osborn may be taken as examples. Each test in the series of eight consists of from 11 to 100 similar tasks in the same operation but with each task involving some slightly different element than is contained in any of the other tasks. The tests may be given either as visual or as oral tests. When used as visual tests each pupil has a record of the actual tasks on which he has failed and on which he needs to spend the most additional effort. The same tests may be frequently used as oral tests, in which case the pupils write the answers as the tasks are dictated. It is, of course, important for the teacher to go a step farther and determine just why certain combinations and processes offer difficulties in order that proper remedial steps may be taken.

Diagnostic tests may be used in exactly the same way in spelling. The words to be studied each day may be dictated at the beginning of the study period and corrected by the pupil. He will then know which words he needs to study. At the end of the period a second test may be used for a similar purpose—not to see how many words he can spell and what marks he should receive for the day's work, but rather for the pupil to realize what words he still needs to study and also just what parts of the words need attention. The diagnostic use of tests is a teaching function. It is a means of directing attention to the immediate things that need to be worked upon and of determining when the tasks have been reasonably well accomplished.

The Gray Check Tests[2] in oral reading are somewhat more complicated but excellent illustrations of diagnostic tests. Not only is the pupil's rate of reading tested but each specific difficulty, such as the mispronunciation of certain words and the tendency to omit or miscall other words, is noted. Thus the pupil finds very specific difficulties to overcome and very definite ends to work toward. The diagnostic test becomes the means of concrete lesson assignment.

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[1] Wisconsin Inventory tests in Arithmetic by Worth J. Osborn, Public School Publishing Co., Bloomington, Illinois.

[2] Standardized Oral Reading Check Tests by W. S. Gray. Public School Publishing Company.

As a final illustration, attention may be called to the Freeman Chart for Diagnosing Faults in Handwriting.[3] It differs from the handwriting scales for measuring quality or general merit in handwriting in that each element, such as quality of line, spacing, uniformity of alignment, uniformity of slant, and letter formation, is isolated from all the others and treated separately. The pupil can compare a specimen of his own handwriting with the chart specimens and with the teacher's assistance can note in what respect his own handwriting is defective. In this way he finds a single feature to work for during the next few lessons. Again he compares a specimen of his handwriting with the chart specimens to see whether or not he has made a gain and also to find out in what feature improvement should next be worked for.

Such tests as these are quite as important from the teaching standpoint as the selective tests. Improvement in handwriting, however, is not merely an improvement in the specific elements alone. It is also an improvement in these elements as interrelated. In some cases improvement in one element may interfere with improvement in other elements, may even lower the general quality of the handwriting temporarily; in other cases improvement in one element may facilitate improvement in other elements or in the quality of the handwriting as a whole. In the same way improvement in rate of reading or improvement in pronunciation may interfere with one another or with comprehension of what is read. Hence it is also important to measure the ability as a whole, so to speak. Likewise a pupil does not learn to spell just the words he studies. Occasionally, studying a word like believe may interfere with one's skill in spelling a word like receive. In most cases, however, learning to spell one word tends to facilitate the spelling of all words containing the same elements. Thus, learning to spell the words tour, conform and nation also involves improvement in the spelling of contour, form, and conformation, whether the spellings of these words are worth knowing in themselves or not. Nor is the tendency any different in the learning of the fundamental operations of arithmetic. To learn that 8 and 7 make 15 and that 7 and 5 make 12 also makes it easier to learn that 8 plus 7 plus 7 are 22. Likewise learning to add ⅓ and ⅕ facilitates learning to add ¼ and ⅙.

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[3] Chart for Diagnosing Faults in Handwriting by Frank N. Freeman. Houghton Mifflin Company, Chicago, Ill.

The Evaluative Function of the Measurement Movement Deals Primarily with Amounts of Achievement. It is not concerned with the detection of capacities nor with the isolation of peculiar difficulties but with the determination of the extent to which capacities have been developed. In all these phases of school work the ability in general is far more extensive than the sum of the separate elements that have been learned. For many purposes it is also important to be able to measure the ability as a whole or some special phase of it. This is a far more complex process than measuring the separate elements. It involves the measurement of their interrelations as well as of their common elements. As the number of facts in any field of knowledge is very large, to test any individual for all the available facts is out of the question. Some sort of a sampling must be resorted to. In the usual written examination the sampling is likely to consist of those facts and problems which are of interest to the instructor or which the instructor thinks are important or essential or tasks that seem to the instructor to cover the whole range of the subject that has been studied. In none of these cases is the sampling likely to represent either the amount acquired in terms of the ease or difficulty of the facts to be learned, of the relationships to be perceived, or of the ideas to be comprehended. As a consequence the selection of tasks may be a very poor sampling of an individual's range of information and is likely to give a very vague and indefinite impression of the amount of it. Nor are school marks any better measures. To a large extent they represent subjective impressions rather than quantities. At best they represent an individual's position among a group or else the hurdles that he has succeeded in clearing. Whether expressed in terms of per cents or in terms of the letters of the alphabet the usual school mark like the usual examination score possesses little definiteness of content and no greater usefulness than reliability. It indicates to the student and his parents whether he has passed or failed in his school work—whether in the teacher's opinion he has come up to a certain indefinite, intangible subjective standard of her own, but like the examination scores it gives no definite indication either of his ability, degree of skill, or range of information, or of the quality of his work. A *B* in English composition, for example, means a very different quantity of ability from one year of high school to another. It also means a very different quantity of ability when assigned by different teachers in the same year of work in high school. The B assigned to the student of unusual capacity is likely to represent a mediocre or even poor quality of work as far as effort is concerned while the same mark assigned to a student of limited capacity in the same class is almost certain to represent an excellent quality of work. Yet the quantity of a student's ability, skill, or information and the quality of his work are two very different conditions as well as two of the most important conditions outside of his capacity that we can learn about him from school examinations. It is quite evident, then, that examinations for measuring abilities, skills, and ranges of information need to be built up and used with the purpose in view of discovering these facts.

The Evaluative Function of the Measurement Movement Is Best Represented by the Educational Scales. These measuring instruments are constructed in such a way that they yield a score that has a definite, tangible meaning, and a known reliability. Unlike the usual classroom test they give a measure of an individual's ability or range of information independent of the particular set of tasks making up the test. The inclusion in the usual classroom test of questions which lie outside the classroom assignments is considered unfair. With such a type of examination the emphasis is upon the pupil's ability to do the particular tasks given in the examination. Not so with the educational scales. Their function is not to test how many of a specific set of questions a pupil can answer but to show how difficult tasks he can do with a certain degree of correctness. In spelling, for example, their function is not to find out how many of a list of twenty words can be spelled correctly, but to determine the degree of difficulty of the words that can be spelled correctly by the pupil in half the cases he attempts. In American history or geography, again, their function is to discover how difficult information the pupil has mastered or how difficult problems he is able to deal with correctly in half of the cases he tries, whereas the score on the usual test merely indicates how many out of a specific list of tasks have been correctly done.

When the Selective, Diagnostic and Evaluative Functions of Measurement Are Kept Distinct More Wholesome Attitudes Toward Examinations May Be Developed. Instead of thinking of examinations as hurdles to be cleared the student and teacher alike may come to view the educational scales as instruments that will give definite indications as to how wide ranges of information, how complex abilities and what quality of skills have already been acquired. They will have the satisfaction of knowing just about what he can do and just about what sort of questions his range of information or his ability enables him to answer with a definite degree of correctness. Cramming to pass examinations will give way to intelligent organization of information and coaching to teaching.

From the teacher's point of view the change in attitude may be quite as marked. Measurements of achievement at the end of a semester will come to have a broader meaning than just a basis for assigning marks. When co-ordinated with the mental tests they give the teacher a basis for evaluating the quality of work as well as the actual attainment of each pupil. They also enable the teacher to evaluate her own methods of teaching, to discover where changes are needed in the distribution of emphasis among the various phases of instruction, to become professionally acquainted with a new class and to become aware of the pupils in need of special attention and diagnostic testing.

From the point of view of the supervisor a measurement program is a means of becoming quantitatively acquainted with the achievement of a school or a school system. Through its results deficiencies may be discovered and remedial measures suggested. How effective these remedial measures are may likewise be discovered. That there are gross inequalities in achievement in any subject in the same grade from school system to school system is rapidly becoming apparent through the use of the educational scales. Such a condition makes for maladjustments and retardation as pupils are transferred from one community to another and even from one school to another. Differences in capacities from community to community render common grade norms of achievement unsatisfactory, however, particularly so as educationalists come to take the view that the need for ranges of information and abilities in the elementary school subjects are proportional to the intelligence of the pupils, just as their achievements in these elements are largely conditioned by their degree of mental maturity. For arriving at reasonable goals of achievement in the elementary school subjects for pupils of different degrees of capacity and for determining when individual pupils have reached these goals and are ready for some new activities, the instruments and methods of the achievement survey are finding a constantly widening application for they represent the best thought of many of the foremost leaders in the new science of education.

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